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Alan G. Porter and Martin G. Rezmer

BASIC Business Subroutines for the Apple II™ and II e™

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ALAN G. PORTER
MARTIN G. REZMER

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PREFACE

Is there life after the *Applesoft Tutorial*? This book is a first step in the quest for the answer to this question. After reading the *Tutorial* cover to cover several times, you may still find it difficult to perform certain functions with your Apple computer. Even though you are armed with an understanding of how INPUT, PRINT, and FOR–NEXT work, you may still have difficulty putting them together in a meaningful order. You know what you want the computer to do, but you are not a professional programmer, so you do not know how to make the computer do it. In this book we present solutions to some of the most frequently encountered programming problems. We define what each problem is, show how to solve it, and give an exact solution (a program) in Applesoft BASIC. We also explain how you can modify the program for your own needs. The basis here is to learn efficient programming techniques and good style by example—a very powerful teaching method.

This book is intended for use by people with widely varying skill levels—from the enthusiastic novice to the advanced programmer. Each chapter will provide you with tools and building blocks to be used in programs you will create in the future.

The material is presented in modular fashion. That is, the materials from Chapter 2 (an input line editor) are expanded on in Chapter 3 to create a screen editor, and so on. The end result is a set of tools that can be used in every program you write. With these tools your programs will be more professional and easier to use, take less time to write, and be able to be modified easily when change becomes necessary.

Our special thanks to the following people: Carol Beal, Tom Bell, Zach Bovinette, Kathy Cukar, Takeshi Endo, Barb Odom, Vicki Porter, Jim Speir, Hal Tobin, Shelley Wright.

CONTENTS

PROGRAMMING FUNDAMENTALS

INTRODUCTION

This book is divided into the following subject areas:

- The input of data, Chapter 2,
- Data storage and manipulation, Chapters 3–6,
- Outputting the data, Chapter 7,
- Putting it all together, a summary exercise, Chapter 8.

Subroutines are provided that show you how to input data into the computer, how to store and work with this data, and then how to output the data to the screen or printer.

The final chapter provides a stand-alone program that summarizes all of these techniques into a personal calendar program.

In this preliminary chapter we will discuss subroutines, programming style and technique, and efficient methods for writing and testing your own programs. We will also present the common structure used in the succeeding chapters in order to prepare you for getting the most out of this book.

SUBROUTINES: WHAT THEY ARE AND HOW TO USE THEM

Simply stated, a *subroutine* is a program that is used over and over again in one program or in many programs. A subroutine can be as small as two lines or as large as several thousand lines. In general, however, subroutines are kept small so that they will be understandable and manageable. Ideally, a subroutine will only perform one function, such as allowing alphanumeric input from the keyboard. By performing only one function, it will always behave as expected, and you will not be surprised by an unusual response. If a subroutine is to perform several functions, it can be made up of several single-function subroutines that are nested together.

A subroutine is distinguished from a "regular" program by two BASIC statements: GOSUB and RETURN. A GOSUB is used by the "calling" program (the main or originating program) to access the subroutine, and a RETURN is used by the subroutine, upon completing its task, to return to the calling program. Except for these two statements, a subroutine is a regular BASIC program.

GOSUB–RETURN When the program encounters GOSUB, it unconditionally branches to the referenced line number. Upon encountering a RETURN, the program branches back to the statement immediately following the most recently executed GOSUB.

EXAMPLE

```
5000   GOSUB 6000
5100   PRINT X%*3
5200   END
6000   INPUT
6100   RETURN
RUN
?100
300
```

In this GOSUB example, when line 5000 is encountered, the program execution sequence jumps to line 6000 and asks for the input of X%. The number 100 is input from the keyboard (see the line following RUN). Then execution resumes at line 5100, and the result of X%*3 (which is 300) is printed on the screen.

The reason for the existence of a subroutine is fairly straightforward: to make the computer do as much of your work as possible. If you have a function in your program that is required several times, you have the option of retyping the function in several places or typing it in once, adding RETURN as the last line and using a GOSUB when you want to use it. Why should you do all the work when the computer will gladly do it at the mere typing of the command GOSUB? Subroutines serve one additional purpose: They make the programs consistent. If the same subroutine is used throughout your programs, then this function will be performed exactly the same way each time. You will not have to remember the exact details of how it works everytime you wish to use it in the program.

To visualize a subroutine, we can think in terms of any function or action that is done repeatedly. By using a subroutine to perform this action, we are always assured that it will be performed exactly the same way each time we need it. Let's use a common example to illustrate this point. How do we start our car? A modern automobile simply requires us to get in and turn the key. The manufacturers have created a "subroutine" (actually, a group of subroutines nested together) to perform the required tasks for us when we turn the key. The action of turning the key starts the subroutine chain that does the following tasks:

- Determines if the choke is needed,
- Turns on the fuel pump,
- Runs the electrical system checkout,
- Engages the starter.

And we are done. We get the same results everytime—unless the system has broken down on us!

The following chapters will present a series of subroutines that you may use in your own programs. These subroutines present only one of many possible ways to solve the problem and may be modified for your own requirements.

PROGRAMMING STYLE

We like to consider computer programming as an art form. As with all art forms, the creator has a "style." This style can determine whether the creation is a work of beauty or something else. Some of us were not born with enormous amounts of style; we have to study others and copy where we can. Style also evolves with time; most of us get better as we gain experience. We rarely, however, go back to an older creation and improve or update its style. It is therefore important to do as good a job as possible the first time through.

The subroutines in this volume reflect our style. Some people will like it, and others will not; but that is art. In the following subsections we summarize some of the elements of our programming style. The elements of style that are most important are those that lead to an increase in understanding and readability of the program. We try to adhere to them as much as possible, but, being human, we do slip from time to time. We hope that by studying our style, you will be able to add those characteristics that you like to your own style.

Meaningful Variable Names

It will come as no surprise to you that not all variable names are meaningful. Even a variable name that is meaningful to you may be totally confusing to another person reading your program. Part of this problem stems from Applesoft BASIC, which only recognizes the first two characters in a variable name. Although BASIC may consider only the first two characters, there is nothing that restricts the use of longer names if you keep the first two characters unique. Thus it is our convention to use as long a name as necessary to clearly define the variable being addressed. Sometimes, the first two characters are a little unusual, but we can still understand what the variable is to be used for.

It is important to remember that for programs in BASIC, variables are used by the entire program. Any variable may be assigned a value at any point in a program, and that value can be used at any other place in the program. This procedure is how information is passed to and from subroutines. Before calling a subroutine, we assign values to the vari-

ables used by that subroutine. After the subroutine has completed its task, those same variables are still available for use by the rest of the program, even though some of the values may have changed in the subroutine.

Line Numbers and Subroutines

We use lots of subroutines in our programs. Since we must use line numbers and not labels (names) to address subroutines, how do we keep them all straight in our mind? We do not renumber the subroutines. Once a subroutine is created and assigned a starting line number, we keep that line number intact. It may look nice to have an entire program evenly numbered, but even numbering is not worthwhile if the subroutines keep moving around. Therefore, we only renumber the main program sections if we must; we do not renumber the subroutine sections.

Our choice of line numbers was not random. There was a plan.

First, we wanted you to be able to add these routines to existing programs, and since most people tend to use smaller-value line numbers, we elected to use larger-value line numbers. This way our routines will not conflict with yours

Second, by carefully selecting line numbers, we can make a program run as fast as possible. When BASIC looks for a line number (as in GOSUB 10000 or GOTO 11000), it first checks to see if the current line number is larger or smaller than the one being searched for. If the current line number is smaller, it begins the search for the desired line beginning at the current line. If the current line number is larger, it begins the search with the first line number in memory.

For example, consider the following program:

```
100
.
.
.
1000    PRINT "HELLO"
1100    GOSUB 2000
1200    GOTO 1000
2000    PRINT "RANDY"
2100    RETURN
```

When BASIC executes line 1100

```
GOSUB   2000
```

it begins the search for line 2000 at line 1200. But when it executes line 1200

```
GOTO   1000
```

it must begin searching at the first line in memory, which is line 100.

If this program were a large one, a lot of time would be wasted going from line 100 to line 1000, simply because there are a lot of line numbers to check. However, getting to line 2000 will be faster because there are fewer line numbers to check. Therefore, because of this characteristic of BASIC, we have tried to place subroutines at a line larger than the line calling the GOSUB or GOTO. Obviously, this technique is not always possible, but it is an easy constraint to live with.

Remark Statements, or What's This?

Most programmers fail to use enough remark (REM) statements in their programs.

REM REM statements are nonexecuting line statements. They are used in programs to provide notes and reminders to the original program author and to others who may subsequently need to go back into the program and figure out its purpose or method.

EXAMPLE

```
1090   REM
1095   REM
1100   REM
1105   X = 11.005    REM  THIS IS A FIXED VALUE
1110   Y = 5.026     REM  THIS IS A FIXED VALUE
1115   REM
1120   REM
1125   REM
```

In this example lines 1090–1100 and 1115–1125 are used to isolate what is found between them. This technique makes the program easier to read and calls attention to lines 1105 and 1110. The remarks after lines 1105 and 1110 indicate what the values in these lines are, where they came from, or what they are used for. In your remarks, use any description desired to remind yourself just what these lines are doing.

When the original author of a REMless program is gone, who will support and modify the work? Usually, no one; the REMless program will be thrown out and rewritten from scratch by another programmer. Therefore it is good practice to use remark statements as much as possible to help both yourself and subsequent users of a program.

In the programs in this book we have used remark lines to separate major sections of the program and to clearly explain, in detail, how it works and what it does. We use remarks wherever possible in the body of a routine to help clarify the processes it is going through. Even groups of blank REM lines add to the clarity of a program by being used to separate the text.

Since program branches, such as GOTO and GOSUB, use line numbers, we use a remark with each one to clarify where the program is going. We also often branch to a REM line that contains the meaning of the routine.

Regardless of who you are or what your position is, the debugging of a program is tedious. But the more remarks you have in a program, the sooner you can fix it and get on to another program.

Multiple Statements on a Line

Most versions of the BASIC language allow you to put several program statements on the same line, usually separated by a colon. Applesoft also allows this procedure. In general, this technique is a poor one, and we do not use it or recommend it, but it does enhance the execution speed of completed programs by eliminating the need to process the extra line numbers. Also, certain commands such as IF–THEN statements frequently require multiple commands on the same line, and they are acceptable there. However, if the line is very long, it should probably be made into a

subroutine and a GOSUB used. As far as we are concerned, only REM statements should be tagged onto a line. So please feel free to add on REM statements as often as you like.

WRITING YOUR PROGRAMS

Once you begin to write your own programs, your own personal programming style will develop, which may be very different from ours as we have described it so far. However, all of your programs should incorporate two important features: They should be user friendly, and they should be tested.

User-Friendly Programs

A user-friendly program is also a programmer-friendly program. A program is considered to be user friendly if it is understandable, predictable, and easy to use. If the program meets these requirements, then the user will be friendly to the programmer. If the program does not meet these requirements, then the user will be very unfriendly to the programmer. Therefore the easier it is to use your program, the happier everyone will be.

Testing Your Programs

All programs should be thoroughly tested before they are given to users. Testing is time-consuming; and the larger a program is, the more variables and conditions there are to test. However, you must remember that a running program is the most essential element of a program that is user friendly, and the only way to verify that a program works is to test it. We readily admit that we have delivered programs that users subsequently found errors in. Unless you spend years testing, you may never find all the errors in your programs, but you must try to be as thorough as possible. If you test a program in steps, as it is being developed, many problems can be discovered and corrected before they become serious. It is also beneficial to have another person test your work as you progress. A second opinion can be very valuable.

MAKE THE APPLE WORK FOR YOU

The whole purpose in writing a program is to have the computer do some of your work. When you design the program, think about the problems that may arise and how they can be solved by the computer automatically as they are encountered. Once again, user-friendly software is programmer friendly. This idea gets us back to the building block concept.

The building blocks we are providing in this book are intended to make the Apple work for both the programmer and the user. The programmer benefits by being able to use ready-made pieces over and over again, and the user benefits by having a consistent and professional program to work with.

We suggest that you purchase a software development system or tool kit. There are several different products available. One such product that is an invaluable aid to development is the Apple DOS Tool Kit. It contains many programs, including the Programmer's Aid. This program can renumber and merge programs, remove remark statements, and produce a variable cross-reference table. This program will come in very handy for those planning to write their own software. The new Apple IIe comes with a merge program and a renumber program on diskette, but it lacks the other helpful programs.

Other hints for making the Apple work for you are given in the following subsections.

Review the Reference Manual

Before you start reading the next chapter, we recommend that you review two sections of the *Applesoft Basic Programming Reference Manual.* They contain some helpful and informative suggestions. Our comments on some of these points follow.

First, read Appendix D, "Space Savers." The following hints are given there:

- Hint 1. "Use multiple statements per line." This technique is *not* a good one. The readability of the program by you or anyone else is greatly hindered by multiple statements on a line, making the program much more difficult to debug.

- Hint 2. "Delete all REM statements." This procedure is a good idea *after* the program is completely debugged.
- Hint 3. "Use integer instead of real arrays whenever possible." A very good idea.
- Hint 4. "Use variables instead of constants." Another very good idea.
- Hint 6. "Reuse the same variables." This procedure can be dangerous. If you must do it, then pick a certain combination of letters to represent your "garbage" variables and use the same ones throughout your programming.
- Hint 9. Using X = FRE(0) to houseclean old strings is a good thing to remember and to do.

Second, read Appendix E, "Speeding Up Your Program." The following hints are given there:

- Hint 1. "Use variables instead of constants."
- Hint 2. "Place the most frequently used variables at the top of your program."
- Hint 4. "Frequently referenced line numbers should be located as early in the program as possible."

These three hints can't be emphasized enough—these are the small things that make a big difference.

Note: The Apple IIe owners will not find these same hints in their manuals. In this case newer is not better.

Apple II Family Differences

The introduction of the Apple IIe with the 80-column card necessitated some changes so that this book is useful for all Apple II users. All of our examples and test programs are formatted for 40-column screens while at the same time working with the IIe 80-column card activated. Satisfying both requirements at once meant that we had to make compromises in our programs. The FLASH command is an excellent example. This command gives your menus and screens a very commanding presence,

but it does not work when the 80-column card is activated. If you are working in 40 columns, you can implement FLASH in the same way as you implement INVERSE (shown in a following chapter).

The 80-column card can also be turned on and off, and its presence can be checked for under program control. Checking for card presence is done by PEEKing memory location C300 and comparing the first ten bytes found with the first ten bytes of the 80-column card ROM.

Perhaps the strongest single factor in favor of the 80-column card is the availability of uppercase and lowercase letters. They provide the most aesthetic screens and are highly recommended if available.

ABOUT THE STRUCTURE OF THE BOOK

The real learning experience in this book lies in the programs that are supplied. Although individual cases may vary, probably the easiest way to read this book is to go through the text of each chapter lightly to get a feel for what is to be done. Then study the programs carefully and study how each was created (recall the learning-by-example statement from the Preface). Diagraming the flow of the program can be very helpful. Read the text again in more detail, and then type in the program, verifying your progress at each test point. Next, start your debugging process—correcting the mistakes made in the entry of the program. By the time the debugging is done, you will have a good feel for what we have presented. Please enjoy yourself, and remember to back up your diskettes as you go.

The following chapters are divided into sections such as design, user features, and programmer features. In using these section topics, we are trying to structure your thinking to help you create programs more efficiently. Here are the points we are trying to make:

Design	Define the basic program function.
User features	Define specific user functions and the special conditions to be met.
Programmer features	Define specific features needed to meet the design criteria.

As each new BASIC command is encountered in the text, we will provide a brief explanation and example. These examples are given to refresh your memory only, and we suggest that you review your Applesoft II reference manual for more detail, as needed.

The format of the program listings in the chapters that follow cannot be precisely duplicated on the Apple II. We have taken artistic license in the placement of the remark statements (through the use of our word processor) to make the listings easier to read.

Many of the chapters build on one another. For instance, the program presented in Chapter 2, the line editor, gets combined with the additional material in Chapter 3 to yield the screen editor. The following list describes which chapters are added together to yield the new one:

Chapter 2	Stand-alone
Chapter 3	Chapters 2 + 3
Chapter 4	Stand-alone
Chapter 5	Chapters 2 + 4 + 5
Chapter 6	Chapters 2 + 4 + 6
Chapter 7	Stand-alone
Chapter 8	Chapters 2 + 4 + 5 + 6 + 7 + 8

For Chapters 2 and 3 the programs are entered by using the Apple's built-in editing capability, which is limited and cumbersome. Once you have a finished product from Chapter 3, you can use the resulting screen editor to enter and debug the programs in the remaining chapters—a real time-saving tool.

AN INPUT LINE EDITOR FOR APPLESOFT BASIC

INTRODUCTION

One feature is common to almost every program: The program asks a question and the user types in an answer. In a BASIC program you normally get the user's answer by using an INPUT statement.

INPUT The INPUT statement requests an input from the user at the keyboard, and the program will not proceed until the input is made.

EXAMPLE

```
5000    INPUT AGE%
5100    PRINT AGE%*2
RUN
?34
68
```

In this example line 5000 causes the user to be prompted, by a question mark on the screen, to supply a number for the variable AGE% (34). Once the number is typed in at the keyboard, line 5100 is executed, and the result (68) is printed on the screen.

The INPUT statement, however, accepts all user input, and the Apple itself only allows rudimentary editing. The programmer tests every entry for a valid response (i.e., a number in the proper range, or a name with only alphabet characters), and the user reenters the information if an error is detected. This process is repeated for every INPUT statement.

Why not have the Apple do some of the programmer's work and at the same time give the user some additional editing capabilities? This task can be done with a line editor. A *line editor* is a subroutine that accepts data entered on the keyboard and processes any special editing characters entered. These characters perform such functions as inserting a space or deleting a character. The line editor is also used to control the exact characters the user is allowed to enter. For example, you could restrict the user to entering numbers only, with no other characters allowed, or you could ask for a simple yes or no response. Of course, many more functions are available with a line editor.

The line editor program is one of the largest routines in this book. It is presented first because it is used as a building block for most of the routines in the following chapters. We have attempted to present this routine in an understandable manner, but don't be too concerned if you must reread a couple of sections before understanding it.

The development of the line editor program in this chapter will progress through a discussion of the major components needed, the methods for displaying the cursor and processing input keystrokes, some editing routines, and finally a set of user instructions. The sections that immediately follow will review the thought processes we want you to go through each time you consider a programming problem.

In this chapter, as in all the following chapters, you will encounter program modules that are to be entered into your computer and debugged. These modules will ultimately result in complete working programs, one for each chapter of the book.

Design

Before writing a computer program, you must define what problem is to be solved and exactly what you want the program to do—a task we call *design.* The problem we wish to begin solving in this chapter is an unfriendly-user interface to the computer. The INPUT statement does not allow editing of existing text or any program control over what the user enters. INPUT does not display the default or existing value; therefore the user cannot edit an existing value. The solution to these problems is a line editor.

What *general characteristics* should the line editor have? It should display the original text, if any, and allow the user to edit it. Periods should be used to show the user the maximum number of characters that can be entered. For example, to enter a *field* (a piece of information the user is entering or editing) 10 characters long, we could have the following displays:

```
..........
Hello.....
110.27....
```

Our line editor includes these features.

The editor should also allow the user to edit and correct mistakes in the text. We want the computer to do some error checking for us, so the line editor should be able to selectively control the type of data entered. It should be able to force numeric entries, or a yes or no response, or to accept any text. Also, since one of the most useful features of a program is an on-line help capability, the line editor should be able to notify the program of a user's help request. All these features are incorporated in our line editor program.

User Features

The specific features of the line editor can be divided into those directed toward the user and those directed toward the programmer. We will address the user features first.

It would be nice if the user could correct typing mistakes in addition to being able to move the cursor left and right. So we implement these editing functions:

- Move cursor left one position.
- Move cursor right one position.
- Skip to the previous word.
- Skip to the next word.
- Skip to end of line.
- Insert a character and slide the text to the right.
- Delete the current character and move the remaining text to the left.
- Delete text from the current character to the end of the line.

Another user feature of the line editor is that it will show one period per allowed character on the screen; the programmer will select the maximum allowable number of characters per field when setting up the screen. This feature is handy, for example, when the user is working with items such as zip code fields, where only five spaces are required, or names, where one space is needed for a middle initial.

As mentioned, an important part of any program is the on-line help system. The line editor supports the help system by allowing the user to request help by striking control Q. (The help system will be presented in detail in Chapter 4.)

Programmer Features

The programmer's features relate to how the programmer interfaces to the line editor. This interface should be as simple as possible, because we do not want it to add more work in creation than it saves in entry. Thus for the basic editor we require four pieces of information:

1. Screen row number where the input is to take place,
2. Screen column number where the input is to take place,
3. A "mask" to define the type and the length of the field,
4. The original text to be edited, if any.

A *mask* allows the programmer to specifically define what is going to be entered and how many characters are going to be entered. That is,

the program tests the input and rejects any that does not meet the mask requirement. For instance, suppose we want a zip code to be entered. Then we will have the program accept only numerical input up to five spaces. Nonnumeric input is rejected, and any input over five spaces is rejected. In this case we are using a numeric-only, five-space mask.

The line editor accepts four types of input data: help request, number, yes/no, and any text. The yes/no field only accepts the letters Y or N, and the any-text field accepts any printable ASCII character. A number field may contain the following symbols:

```
- . 0 1 2 3 4 5 6 7 8 9
```

A Word of Advice

Before you start to enter the first lines of the program given in the next section, we have several suggestions.

First, it is important to type in the program with all of the remark statements intact. The REMs will help you in the debugging of the program, and they are also used as entry points for most of the GOSUBs.

Second, Apple has kindly included some elementary editing capabilities in the Apple II computer family. Use of this built-in editing ability can save many hours of time and frustration in the entry of the line editor program presented in this chapter and the screen editor program in Chapter 3. The editing commands are not exactly the same for all members of the Apple II family, so please check the following references for your specific machine:

- Apple II and Apple II+: page 116 of the *Applesoft Tutorial*, middle of the page—the ESC I, ESC J, ESC K, or ESC M.
- Apple IIe: pages 71–86 of the new *Applesoft Tutorial* for all of the above plus expanded ESC commands.

LINE EDITOR TEST ROUTINE

The program segment that follows is the first program module you will enter in your computer. This module is the first of many you will enter in this chapter and succeeding chapters. The programs (one for each chap-

ter) are broken down into modules for two reasons. First, it is easy to understand and enter small modules. Second, it is far easier to debug small pieces of code than to debug large pieces.

This first module is a test program for the line editor modules presented in succeeding sections of the chapter. It allows you to define a field at any location on the screen and then use the line editor to input and edit.

The line editor test routine program is as follows:

```
10      REM
20      REM  LINE EDITOR TEST ROUTINE
30      REM  ASKS FOR INITIAL CONDITIONS THEN IT
40      REM  USES THE LINE EDITOR.
50      REM
60      HOME
70      INPUT "ENTER MASK ";MASK$
80      INPUT "ENTER TEXT ";ENTRY$
90      INPUT "ENTER ROW  ";ROW%
100     INPUT "ENTER COL  ";COL%
110     HOME
120     GOSUB 50000     : REM  THE LINE EDITOR
130     VTAB 20
140     PRINT
150     IF HELP% = 1 THEN PRINT "HELP REQUESTED"
160     PRINT
170     PRINT ">";ENTRY$;"<"
180     VTAB 24
190     INPUT "ENTER (CR) TO CONTINUE OR END TO EXIT ";A$
200     IF A$ < > "" THEN END
210     GOTO 60
220     REM
230     END
50000   REM  BASIC LINE EDITOR
52130   REM  DISPLAY TEXT$
60000   RETURN          : REM  UNIVERSAL RETURN FOR TESTING
```

At the end of the test routine, note the many strange line numbers. Each line number represents a subroutine that may be called but isn't

written yet. By including the line number, we prevent our getting an error message later. The RETURN on line 60000 sends the program back to the calling program. As each routine is entered, we simply overwrite and thus erase a line number as it is used.

TEST POINT

Test points, encountered here for the first time, will appear regularly from now on to enable you to test each program module before adding it to the next module. We will point out the most pertinent conditions to test for, simplifying your debugging to small modules.

Perform the following steps after the line editor test program has been entered:

1. Save the program on your disk.
2. Enter

```
RUN (CR)
```

where (CR) means to strike the return key.

The program should clear the screen and ask you to ENTER MASK. Enter the desired mask and hit return. Then you will be asked for the text to fill the mask and also for the row/column location for the display on the screen. After you enter (CR), the process should repeat itself. When you wish to stop going through this loop, strike control C and reset, or enter END (CR) on the ENTER (CR) TO CONTINUE line.

It is always a good idea to provide your users with a consistent and clean way to exit your programs. For example, in the line editor test program you are allowed to enter the word END as a response. Terrible problems can crop up if your users get in the habit of striking control C or reset to exit a program. For example, if users strike reset when working with disk files, there may be some information in the disk buffer area that

has not been saved on the disk. It will be saved only if the file is closed properly. Therefore, striking the reset key will effectively ruin the file because it has not been updated completely.

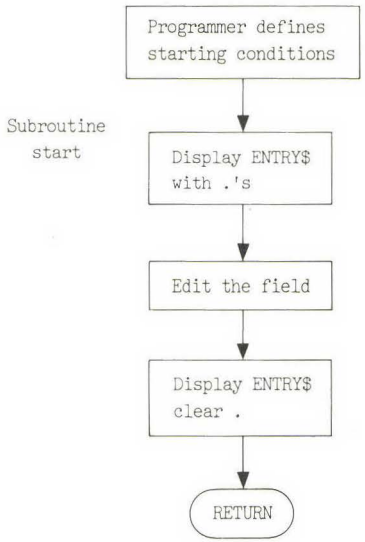
BASIC LINE EDITOR PROGRAM

A flowchart for the basic line editor process is shown in Fig. 2.1. This flowchart gives a general overview of the program to be developed. Basically, the flowchart says that the programmer defines the characteristics of the field to be entered and the current contents of the field. The line editor first displays the field with periods, and then it allows the user to enter and/or edit the field. Finally, the field will be redisplayed and the periods erased.

The basic line editor program is as follows:

```
50000   REM  BASIC LINE EDITOR
50005   REM
50010   REM
50015   REM  THIS IS A BASIC LINE EDITOR
50020   REM
50025   REM  THE PROGRAMMER CALLS IT USING THE FOLLOWING VARIABLES
50030   REM
50035   REM  ROW% => SCREEN LINE NUMBER
50040   REM  COL% => SCREEN COLUMN NUMBER
50045   REM  ENTRY$ => TEXT TO BE EDITED
50050   REM  MASK$ => DATA TYPE TO BE ALLOWED
50055   REM  WHERE:
50060   REM    A = ALPHANUMERIC
50065   REM    # = NUMBER FIELD ONLY
50070   REM    Y = YES/NO FIELD
50075   REM    Q = HELP REQUEST OK, USE IN ANY CHARACTER
50080   REM  THE LENGTH OF MASK$ IS THE MAXIMUM LENGTH OF THE
50085   REM  INPUT STRING
50090   REM
50095   REM
50100   PLACE% = 1                : REM  SET THE STARTING POSITION
```

FIG. 2.1 Overview of line editor program




```
50105   REM
50110   FILL$ = "."              : REM  DISPLAY DOTS
50115   HELP% = 0                : REM  CLEAR THE HELP FLAG
50120   CTRL% = 0                : REM  CLEAR THE EXIT FLAG
50125   GOSUB 52130              : REM  DISPLAY ENTRY$
50130   GOSUB 50165              : REM  EDIT THE STRING
50135   FILL$ = " "              : REM  CLEAR THE SCREEN
50140   GOSUB 52130              : REM  DISPLAY ENTRY$
50145   RETURN                   : REM  GO BACK TO CALLER
50150   REM
50155   REM  **********************
50160   REM
```

The explanations for various parts of this program and its GOSUBs are given in the following subsections.

Explanation of Variables

The basic line editor program consists mostly of REM statements (remarks). It is always good practice, at the beginning of a subroutine, to define who wrote it, when it was last changed, what it does, and the purpose of the major variables used, as shown in the remarks in lines 50000–50160.

The variables ROW% and COL% (lines 50035 and 50040) are used to position the text on the screen. ROW% is a number between 1 and 24. In 40-character mode COL% is a number between 1 and 40; while in 80-character mode it is a number between 1 and 80. HELP% will be set equal to 1 if the user requests help; otherwise, it will be set equal to 0.

The % symbol in the names means that these variables are integer variables. An integer is a whole number between −32,767 and +32,767. Throughout this book we will use integers whenever possible. We do so for several reasons. First, most programmers do not use integer variables; therefore by using integer variables, we can avoid variable name conflicts within your programs. For example, A, A%, and A$ are all treated as individual and unique variables, even though they have similar names. Second, integer variables require less memory space than floating-point (decimal-point) variables, and we want the subroutines to be as compact as possible.

FILL$ (line 50135) is the character used to illustrate the field's maximum length. For example, if FILL$ equals a "." and the field is to be six characters long, then the line editor will display

```
. . . . . .
```

six dots, to show the field's maximum length.

ENTRY$ (line 50045) contains the text to be edited. If there is no text to be edited, then ENTRY$ is cleared by the line

```
ENTRY$""
```

MASK$ (line 50050) is used to define the type and the length of the field to be edited. In the programs in this book we will use one symbol to represent each character in the field. Thus an A will be used to indicate

FIG. 2.2 Field parameter examples

MASK$	DESCRIPTION
AAAAAAAAAAAAAAAAAAAA	Accept any 20 characters.
AAAAAAAA	Accept any 8 characters.
AAAAAAAAAAAAAAAAAAAA	Accept any 20 characters.
######	Accept a 6-digit number.
##########	Accept a 10-digit number.
Y	Allow *only* Y or N entry.
AAA###	Accept a total of 6 characters; the first 3 may be any character and the last 3 must be numeric. (For example, this entry could be an inventory part number.)

that any text may be entered, that is, any printable ASCII character. For example,

```
MASK$ = "AAAAAAAAAA"
```

means "accept any character up to a maximum length of ten characters." A # is used for numeric fields; a Y for yes/no fields. Figure 2.2 contains several examples of how these various parameters are used. And, as always, help is available to the user anytime entry is requested, no matter what the mask definition.

Notice that we have not restricted the variable names to only two characters, but we have tried to use meaningful names. And not just a name meaningful today as we design the program, but one still meaningful twelve months from now when we return to make further enhancements.

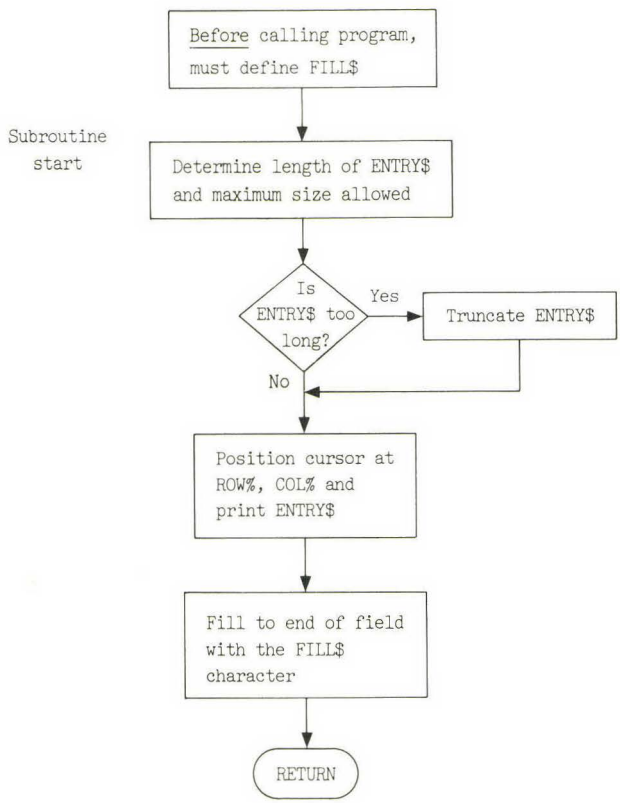
TEST POINT

At this point the program is not yet functional, but it is a good idea to test what is entered to make sure it at least returns you to the beginning of the program. Execute the program by entering

```
RUN (CR)
```

If the program does not return you to the test routine, then verify that you typed in the above routine correctly.

FIG. 2.3 Display subroutine



Explanation of the Display Subroutine

The display subroutine, called by line 50125 GOSUB 52130, is flowcharted in Fig. 2.3. This routine displays the text in the current ENTRY$ at the requested screen position and the requested length of the field, using the FILL$ character. If there is no text to display, then it will simply show one dot for each character allowed.

FILL$ must be set before this subroutine is called. FILL$ is the character used to show the maximum field length. Figure 2.1 shows that the first time this subroutine is used, it displays a period; the last time it is used, a blank or space character is used as FILL$. The space will remove the periods and clean up the screen display.

The display program corresponding to the flowchart in Fig. 2.3 is as follows:

```
52135   REM  FILL$ IS THE FILL CHARACTER
52140   REM  TXTSIZE% IS THE LENGTH OF ENTRY$
52145   REM  MAXSIZE% IS THE MAXIMUM ALLOWED LENGTH
52150   REM
52155   REM
52160   TXTSIZE% = LEN (ENTRY$) : REM  HOW LONG IS THE CURRENT FIELD?
52165   MAXSIZE% = LEN (MASK$)  : REM  WHAT IS THE MAX LENGTH ALLOWED?
52170   REM
52175   REM  IS ENTRY$ TOO LONG?
52180   REM
52185   IF TXTSIZE% > MAXSIZE% THEN
          ENTRY$ = LEFT$ (ENTRY$,MAXSIZE%):TXTSIZE% = MAXSIZE%
52190   REM
52195   REM  POSITION THE CURSOR
52200   REM
52205   VTAB ROW%               : REM  ROW POSITION
52210   POKE 36, COL%           : REM  COLUMN NUMBER - HTAB
52215   REM
52220   REM  PRINT THE TEXT
52225   REM
52230   PRINT ENTRY$;           : REM  NO LINE FEED
52235   REM
52240   REM  PRINT THE FILL CHARACTER
52245   REM
```

```
52250   IF TXTSIZE% = MAXSIZE% THEN RETURN : REM  NO FILL$ TO PRINT
52255   FOR XX = TXTSIZE% TO MAXSIZE% - 1
52260   PRINT FILL$;
52265   NEXT XX
52270   RETURN                : REM  ALL DONE
52275   REM
52280   REM  **********************
52285   REM
```

The display subroutine starts by using the LEN (LENgth) command (lines 52160 and 52165) to determine the length of ENTRY$ and MASK$.

LEN The LEN command returns the number of characters contained in the referenced string as an integer value between 0 and 255.

EXAMPLE

```
5000   A$ = "HAPPY DAYS"
5100   PRINT A$;LEN(A$)
RUN
HAPPY DAYS 10
```

As the example shows, the number of characters and spaces in A$, HAPPY DAYS, is equal to ten.

Remember that the length of MASK$ is the maximum length of the field.

Next, a test is made in the display program (line 52185) to see if ENTRY$ is larger than MASK$. This test can only occur the first time the line editor is called, because the editor will not allow the user to enter too many characters. If ENTRY$ is too long, then the editor will truncate the extra characters.

After ENTRY$ fits into the allotted space, the cursor is positioned and ENTRY$ is printed (lines 52205, 52210, and 52230). Finally, a FOR-

NEXT loop (lines 52250 through 52265) is used to fill the remainder of the field with the FILL$ character.

FOR–NEXT The FOR–NEXT looping command executes the statements after the FOR statement until the NEXT statement is encountered. Then the counting variable is incremented, and the process is repeated until the counting variable reaches the maximum value desired. Once the maximum value is reached, program execution proceeds to the statement following the NEXT. A STEP statement can also be used in a FOR–NEXT loop to increment the loop in values other than 1 (the default value).

EXAMPLE

```
5000   FOR I = 1 TO 5
5100     PRINT I
5200   NEXT
RUN
1
2
3
4
5
```

In this FOR–NEXT loop we simply count up from 1 to 5 by ones.

EXAMPLE

```
5000   FOR I = 1 TO 20 STEP 5
5100     PRINT I
5200   NEXT
RUN
1
6
11
16
```

This FOR–NEXT loop counts up in intervals of five.

EXAMPLE

```
5000   FOR I = 10 TO 1 STEP -1
5100     PRINT I
5200   NEXT
RUN
10
9
8
7
6
5
4
3
2
1
```

This example shows how to count down by using a negative step.

At this point in the display subroutine, we have positioned ENTRY$ on the screen and shown the field's maximum length.

Variables such as X, XX, and Y (see line 52255) are "garbage" variables. That is, they have only immediate meaning and may be changed by any routine. They are used to count loops and to temporarily hold values. Remember that garbage variables are not used by a subroutine that you call. Always use a unique name if you want to make sure that the variable remains unchanged by subroutines.

TEST POINT

The display program is the first subroutine that really does someting; it displays any preexisting text and a dot to indicate the number of allowable characters. How do you select a series of tests to perform? Experienced programmers test the extremes of a subroutine. Programs tend to be stable in the midranges of their operation but may fail at the extremes of their operations. The best way to illustrate what is meant by this statement is to look at what tests should be performed on this subroutine.

Take a moment now and think about what tests you might perform. Although this routine is simple, there are a number of extremes that need to be tested. First, identify the important variables used in this subroutine. They are as follows:

ENTRY$	Text field
MASK$	Field type and length
ROW%	Screen row number
COL%	Screen column number

Next, identify the extreme values for each of these variables:

VARIABLE	TEST EXTREME
ENTRY$	Length = 0 (i.e., null field)
	Length = length of MASK$
	Length > length of MASK$
MASK$	Length = 1
	Length = screen width
ROW%	Line 1
	Line 24
COL%	First column
	Last column

Since this subroutine is to be controlled by the programmer, certain extremes that will cause an error condition have been intentionally ignored. These errors occur if ROW% or COL% point to locations off the screen, as when one or both are equal to 0, or when ROW% > 24 or COL% > screen width. Also, if MASK$ is a null string, an error will occur. If you find yourself being forgetful, then you can add simple tests before line 50100 in the basic line editor program to verify that ROW%, COL%, and MASK$ have valid values. The meaning of "extremes" should become apparent to you as you read through the above list.

Make sure that the routine works properly for all ENTRY$ text fields. Test it with no text, too much text, and the maximum acceptable amount of text. Additionally, be sure to test those combinations of extremes that appear to be extreme extreme cases—for example, ROW% = 24, MASK$ length = screen width, and ENTRY$ > MASK$ length.

Note that the editor described in this chapter is not a "wraparound" editor—it is a line editor. If the input string goes beyond the last column of the screen, some commands, such as DELETE TO END OF LINE, will give strange results. Keep the limits of the program in mind during your testing and experiment with them.

Explanation of the Edit Subroutine

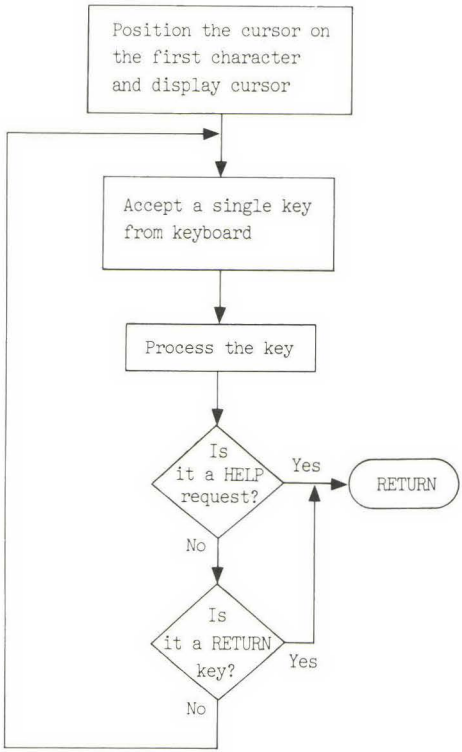
The flowchart shown in Fig. 2.4 describes the process for editing the field. This subroutine is called by line 50130, GOSUB 50165, in the basic line editor program. The flowchart details the following sequence of events: Position and display a cursor over the first character in the field. Next, accept a single character from the keyboard, process it, and then get another one. When a RETURN is entered, or if a help request is made, then return to the calling program.

Here is the program that edits the field:

```
50165   REM  EDIT THE ENTRY$ FIELD
50170   REM
50175   REM  POSITION THE CURSOR
50180   REM
50185   VTAB ROW%                  : REM  VERTICAL POSITION
50190   GOSUB 52000                : REM  PRINT THE CHARACTER IN INVERSE
50195   REM
50200   REM  ACCEPT A KEY FROM THE KEYBOARD
50205   REM
50210   KEY% = PEEK (49152)        : REM  TEST FOR INPUT
50215   IF KEY% < 128 THEN GOTO 50210 : REM  LOOP UNTIL ENTRY
50220   REM
50225   REM  IF HERE THEN A KEY PUSHED
50230   REM
50235   XX = PEEK (49168)          : REM  CLEAR KEYBOARD
50240   KEY% = KEY% - 128          : REM  STRIP OFF FLAG BIT
50245   REM
50250   REM  PROCESS THE KEY
50255   REM
50260   GOSUB 50295                : REM  KEY% PROCESSOR
50265   IF HELP% > 0 THEN RETURN   : REM  HELP REQUESTED BY USER
50270   IF CTRL% > 0 THEN GOSUB 52070: RETURN : REM  CONTROL KEY EXIT
50275   GOTO 50210                 : REM  GET THE NEXT KEY
50280   REM
50285   REM  ****************************
50290   REM
```

VTAB (line 50185) is used to position the cursor on the correct screen row.

FIG. 2.4 Subroutine for editing the field



VTAB The VTAB command places the cursor on the specified line without changing the horizontal position.

EXAMPLE

```
VTAB 10
```

This command moves the cursor to row 10.

PEEK (see lines 50210 and 50235) is used to accept characters from the keyboard. PEEK returns the numeric value of a memory location; it can return a value between 0 and 255. You may recall that the Apple uses eight-bit memory, named bit 0 through 7. Bit 0 is the low bit, and bit 7

FIG. 2.5 ASCII character codes

Hex. No.	Binary No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Hex. No.	Binary No.	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	0	16	SP 32	Ø 48	@ 64	P 80	` 96	p 112	128	144	SP 160	Ø 176	@ 192	*P* 208	` 224	*p* 240
1	0001	1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	*!* 161	*1* 177	*A* 193	*Q* 209	*a* 225	*q* 241
2	0010	2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	" 162	*2* 178	*B* 194	*R* 210	*b* 226	*r* 242
3	0011	3	DC3 19	# 35	*3* 51	C 67	S 83	c 99	s 115	131	DC3 147	# 163	*3* 179	*C* 195	*S* 211	*c* 227	*s* 243
4	0100	4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	$ 164	*4* 180	*D* 196	*T* 212	*d* 228	*t* 244
5	0101	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	% 165	*5* 181	*E* 197	*U* 213	*e* 229	*u* 245
6	0110	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	& 166	*6* 182	*F* 198	*V* 214	*f* 230	*v* 246
7	0111	BEL 7	23	´ 39	7 55	G 71	W 87	g 103	w 119	BEL 135	151	´ 167	*7* 183	*G* 199	*W* 215	*g* 231	*w* 247
8	1000	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	BS 136	CAN 152	*(* 168	*8* 184	*H* 200	*X* 216	*h* 232	*x* 248
9	1001	HT 9	25	) 41	9 57	I 73	Y 89	i 105	y 121	HT 137	153	*)* 169	*9* 185	*I* 201	*Y* 217	*i* 233	*y* 249
A	1010	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	LF 138	154	* 170	*:* 186	*J* 202	*Z* 218	*j* 234	*z* 250
B	1011	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	VT 139	ESC 155	*+* 171	*;* 187	*K* 203	*[* 219	*k* 235	*{* 251
C	1100	FF 12	28	, 44	< 60	L 76	\ 92	l 108	: 124	FF 140	156	*,* 172	< 188	*L* 204	\ 220	*l* 236	*:* 252
D	1101	CR 13	29	− 45	= 61	M 77	] 93	m 109	} 125	CR 141	157	− 173	= 189	*M* 205	*]* 221	*m* 237	*}* 253
E	1110	SO 14	30	. 46	> 62	N 78	^ 94	n 110	~ 126	SO 142	158	*.* 174	> 190	*N* 206	^ 222	*n* 238	~ 254
F	1111	SI 15	31	/ 47	? 63	O 79	- 95	o 111	DEL 127	SI 143	159	*/* 175	*?* 191	*O* 207	- 223	*o* 239	DEL 255

is the high bit. In the Apple, text information is stored in ASCII format (see Fig. 2.5). There are only 128 ASCII characters; therefore bit 7 is not used when describing an ASCII character.

The Apple keyboard is located at memory address location 49152. If a PEEK is made of this location, then the value of the last key entered will be returned. The Apple informs you that a key is entered by setting bit 7 equal to 1 and bits 0 through 6 equal to the ASCII value of the key entered. Whenever bit 7 is equal to 0, no key input has been received from the keyboard. In other words, if the PEEK returns a value *greater* than 128, then a key has been entered; if the value is *less* than 128, no key has been entered. Once a key is entered and accepted, Apple considers it the program's responsibility to inform the Apple that the key has been received and that another key may be entered. This information is given by PEEKing address 49168; this procedure will set bit 7 back to 0 until another key is entered.

The following sample routine is provided to let you experiment with and to help you fully understand the keyboard PEEK routine just discussed. Type it in and experiment by running this routine by itself.

```
10   KEY% = PEEK (49152)
20   PRINT KEY%
30   IF KEY% < 128 THEN GOTO 10
40   XX = PEEK (49168)
50   KEY% = KEY% - 128
60   PRINT KEY%, CHR$(KEY%)
70   INPUT "ENTER CR";A$
80   GOTO 10
```

You might experiment and delete line 40 to see what effect this action will have.

DISPLAYING A CURSOR

In order for the user to know what character is being edited, the current cursor position must be displayed. In the field-editing program (line 50190, GOSUB 52000) the current character is displayed in inverse

video. When there is no character to display, then a space is used. A space is a bright box when displayed in inverse.

The following program will print a character in inverse:

```
52000   REM  PRINT CHARACTER IN INVERSE
52005   REM  THIS GIVES THE ILLUSION OF CURSOR MOVEMENT
52010   REM
52012   VTAB ROW%                      : REM  POSITION CURSOR
52015   POKE 36, (COL% + PLACE% - 1) : REM  HTAB
52020   INVERSE                        : REM  REVERSE VIDEO
52025   XX$ = MID$ (ENTRY$,PLACE%,1) : REM  MOVE FOR THE NEXT IF
52030   IF XX$ = "" THEN XX$ = " "   : REM  IF NULL MAKE IT A SPACE
52035   PRINT XX$;                     : REM  PRINT THE INVERSE
52040   NORMAL                         : REM  RESTORE TO NORMAL VIDEO
52045   POKE 36, (COL% + PLACE% - 1) : REM  REPOSITION THE CURSOR - HTAB
52050   RETURN
52055   REM
52060   REM  **********************
52065   REM
```

PLACE% is used to keep track of the current cursor position. However, PLACE% could have been set by the calling program. For example, if we wanted to begin editing at the end of a field instead of the beginning, we would set PLACE% equal to the length of the field instead of 1.

After the cursor is positioned over the current character, using a POKE (line 52015), the INVERSE command is given (line 52020) and the character is printed. A NORMAL command is given (line 52040), and then the cursor is repositioned over the character (line 52045).

PRINT The PRINT command causes a line feed (increments one line) when encountered without option parameters. With options, the values of the list following the PRINT command are evaluated and printed.

INVERSE The INVERSE command causes all subsequent characters to be printed as black letters on a white background instead of the normal white on black.

NORMAL The NORMAL command negates the preceding command and restores the video to the regular white-on-black mode.

TEST POINT

The print-in-inverse subroutine displays the cursor. After the line editor displays the text field to be edited, it positions the cursor over the first character. If there is a character in the first position, it will be shown in inverse; otherwise, a bright block will be shown.

PROCESSING A KEY

Subroutine GOSUB 50295 (line 50260 of the field-editing program) is used to display or process the key pressed by the user. A key can be either a control, a special character, or regular text.

Control characters are used for editing the text and moving the cursor. A control character is produced by holding down the CTRL (control) key while simultaneously pushing any letter key, A through Z. From Fig. 2.5 we see that the ASCII value of control A is 1, while the ASCII value of letter A is 65. Similarly, the ASCII value of control Z is 26, while the letter Z is represented by the value 90. The ESC (escape) key is a special key that has an ASCII value of 27.

The program that tests for a control key is as follows:

```
50295   REM  TEST FOR CONTROL KEY
50300   REM
50305   IF KEY% < = 31 THEN GOSUB 51000: RETURN: REM  PROCESS AND RETURN
50310   REM
50315   REM  MUST BE AN ALPHANUMERIC
50320   REM
50325   REM  TEST THE MASK TO DETERMINE DATA TYPE
50330   REM
50335   IF MID$ (MASK$,PLACE%,1) = "A" THEN GOSUB 50900: RETURN
50340   IF MID$ (MASK$,PLACE%,1) = "#" THEN GOSUB 50390: RETURN
50345   IF MID$ (MASK$,PLACE%,1) = "Y" THEN GOSUB 50440: RETURN
50355   REM
50360   REM  BAD MASK CHARACTER
50365   REM
50370   RETURN
50375   REM
50380   REM  ****************************
50385   REM
```

If the user presses a control or special key, a branch is made to the control character subroutine, GOSUB 51000 (line 50305). If any other key is pressed, the program checks this character to see if it is acceptable.

MID$ (lines 50335 through 50345) is used to determine the data type defined in MASK$. Then a branch is made to the appropriate character-checking subroutine.

MID$(A$,N,X) The MID$ command returns the character string starting at N in the string A$ for X characters. If X is not present, then the program continues until the end of the string is reached.

EXAMPLE

```
5000   A$ = "HAPPY DAYS"
5100     PRINT MID$(A$,7,3)
RUN
DAY
```

In this example of MID$ we count seven characters into A$ and extract the next three characters encountered. The result is that DAY is extracted from A$.

As an example, suppose that in the line editor program we are viewing the first character position, and MASK$ is defined as

```
MASK$ = "AAAAAAAAAA"
```

Then the branch is made to subroutine 50900, the universal-character-accept routine. In contrast, if MASK$ is

```
MASK$ = "####"
```

then the branch is made to subroutine 50390, where a check verifies that a number has been entered. When a number is entered, it will be added to ENTRY$ and displayed; otherwise, it will be ignored. These tests occur in lines 50335–50345, but the subroutines called in these lines have not been presented yet.

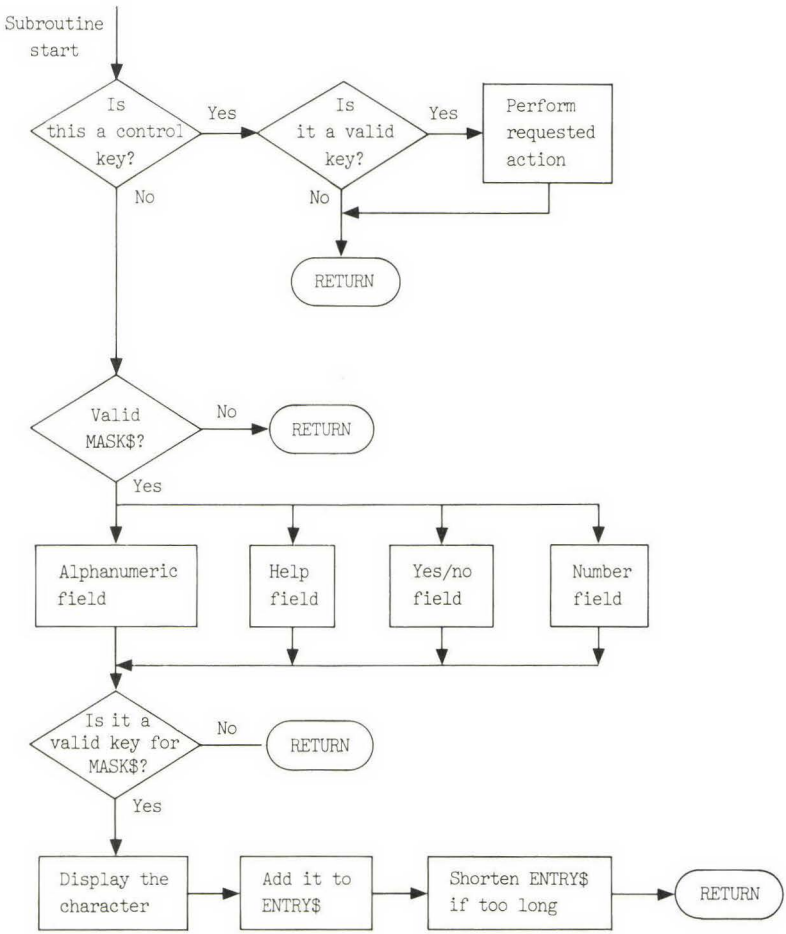
In our version of the editor only five different data types are allowed. You can add other branches to this routine if more data types are desired. For example, Apple IIe users may wish to have a mask that converts all lowercase letters to uppercase.

Additional features of processing a key are illustrated in the following subsections.

Processing the Input Keys

After a key is pressed, the program must determine whether it is a control key (character) or an alphanumeric key. If it is a control character, then the routine must decide whether it is a valid character, and, if so, perform the required action. If it is not a control character, the mask

FIG. 2.6 Flowchart for accepting a character



character must be checked and the character-type test performed. If a valid character has been entered, then it is added to ENTRY$ and displayed on the screen. This process is flowcharted in Fig. 2.6.

Character-Accept and Display Routines

When a valid character is entered, it is added to ENTRY$ and displayed on the screen. Then the cursor is moved right one position.

There are several tests that must be performed in the character-accept routine. First, a check is made to see whether the insert mode is on (INSERT% = 1); if it is, a space is inserted before the character is added. Second, a check is made to determine how to add the character; there are different ways to add the character depending on where the character is to go. Finally, a check is made to see whether the new field is too long; if it is, it must be truncated to MAXSIZE%.

The test program to check for an alphanumeric field is as follows:

```
50900   REM  PRINT KEY% AND ADD TO ENTRY$
50905   REM
50910   IF INSERT% = 1 THEN GOSUB 51315 : REM  INSERT A SPACE
50915   TXTSIZE% = LEN (ENTRY$) : REM  MAKE SURE WE HAVE CORRECT TXTSIZE%
50922   REM  ADD TO END OF ENTRY
50925   IF PLACE% > TXTSIZE% THEN ENTRY$ = ENTRY$ + CHR$ (KEY%): GOTO 50945
50926   REM  ADD AS FIRST CHARACTER
50930   IF PLACE% = 1 THEN ENTRY$ = CHR$(KEY%) + MID$(ENTRY$,PLACE% + 1): GOTO 50945
50932   REM  ADD AS LAST CHARACTER
50935   IF PLACE% = TXTSIZE% THEN
          ENTRY$ = LEFT$(ENTRY$,PLACE% - 1) + CHR$(KEY%): GOTO 50945
50936   REM  ADD IN THE MIDDLE SOMEWHERE
50940   ENTRY$ = LEFT$(ENTRY$,PLACE% - 1) + CHR$(KEY%) + MID$(ENTRY$,PLACE% + 1)
50945   TXTSIZE% = LEN (ENTRY$)
50946   REM  IF TOO BIG TRUNCATE IT
50950   IF TXTSIZE% > MAXSIZE% THEN ENTRY$ = LEFT$ (ENTRY$,MAXSIZE%)
50955   REM
50960   REM  NEED TO MOVE RIGHT ONE PLACE
50965   REM
50970   GOSUB 51425             : REM  RIGHT ARROW
50975   RETURN
50980   REM
50985   REM  ***************************
50990   REM
```

The programs for the other two data tests—yes/no field and number field—are listed next.

```
50390   REM  ACCEPT A NUMBER
50395   REM
50400   REM  TEST TO SEE IF IT IS A VALID NUMERIC TYPE OF CHARACTER
50405   REM
50410   IF (KEY% < 45) OR (KEY% > 57) THEN RETURN : REM  BAD KEY
50415   IF KEY% = 47 THEN RETURN : REM  BAD KEY ALSO
50420   GOSUB 50900              : REM  GOOD KEY SO ACCEPT IT
50425   RETURN
50430   REM  ************************************
50435   REM
50440   REM  TEST FOR YES OR NO
50445   IF (KEY% < > 89) AND (KEY% < > 78) THEN RETURN : REM  BAD KEY
50450   GOSUB 50900              : REM  ACCEPT IT
50455   RETURN
50460   REM  ************************************
```

For each data type, if KEY% is in the correct range, then a valid key has been entered. If a bad key is entered, then the routine RETURNs and the key is effectively ignored. If a good key is entered, then the routine is called that places the character into the field.

PROCESSING CONTROL KEYS: EDITING ROUTINES

The line editor uses control characters to move the cursor and edit the text. These characters are summarized in Fig. 2.7. The letter selections are arbitrary. If you do not like them or if another program on your computer uses different characters, you may redefine them to be consistent.

The right and left arrows, control U and H, respectively, are used to move the cursor right and left. In our editor the right arrow key will *not* erase the characters as it passes over them. Control A is used to skip to the previous word. Control D is used to delete a character and compress the field. A character may be inserted into the middle of text by using a control F to turn the insert mode on. The insert mode is kept on until any control character is entered, including a control F. A control N is used to jump to the end of the line. Control W is used to skip to the next word, and control Y will delete everything to the right of the cursor.

FIG. 2.7 Control characters

Control A	Skip to the previous word.
Control D	Delete this character and compress the line.
Control F	Insert a character into the line.
Control N	Skip to the end of the line.
Control Q	HELP request at any time.
Control W	Skip to the next word.
Control Y	Erase to the end of the line.
Right arrow	Move right one character.
Left arrow	Move left one character.

Subroutine 51000 in the program that follows uses conditional IF statements to branch to the editing routines. To add new editing features, you would simply add more conditionals and insert the code in the space before line 52000.

The following subroutine processes the control keys. The individual editing routines for the various control characters are described in the succeeding subsections.

```
51000   REM  PROCESS A CONTROL KEY
51005   REM
51010   REM  EXIT KEYS SUCH AS RETURN SET CTRL%
51015   REM
51020   REM
51025   REM  ^A = 1  > PREVIOUS WORD
51030   REM  ^D = 4  > DELETE THIS CHARACTER
51035   REM
51040   REM  ^F = 6  > FILL WITH A SPACE
51045   REM  ^H = 8  > LEFT ARROW
51050   REM  ^N = 14 > SKIP TO END
51055   REM  ^Q = 17 > HELP REQUEST
51060   REM  ^U = 21 > RIGHT ARROW
51065   REM  ^W = 23 > NEXT WORD
```

```
51070   REM  ^Y = 25 > ERASE TO END
51075   REM  IGNORE ALL OTHER KEYS
51080   REM
51085   CTRL% = 0                      : REM  CLEAR EXIT FLAG
51090   IF KEY% = 6 THEN GOSUB 51280 : RETURN : REM  INSERT
51095   INSERT% = 0                    : REM  TURN INSERT OFF
51100   IF KEY% = 1 THEN GOSUB 51555 : REM  PREVIOUS WORD
51105   REM
51110   IF KEY% = 4 THEN GOSUB 51210 : REM  DELETE
51115   REM
51120   IF KEY% = 8 THEN GOSUB 51380 : REM  LEFT ARROW
51125   REM
51130   IF KEY% = 13 THEN CTRL% = 1  : REM  RETURN KEY
51135   REM  CHECK HELP REQUEST
51140   IF KEY% = 17 THEN HELP% = 1  : RETURN : REM  HELP REQUEST
51145   REM
51150   IF KEY% = 14 THEN GOSUB 51680: REM  GOTO END
51155   REM
51160   IF KEY% = 21 THEN GOSUB 51425: REM  RIGHT ARROW
51165   REM
51170   IF KEY% = 23 THEN GOSUB 51475: REM  NEXT WORD
51175   REM
51180   IF KEY% = 25 THEN GOSUB 51630: REM  ERASE TO END
51184   IF KEY% = 27 THEN CTRL% = 27 : RETURN : REM  ESC
51185   REM
51190   RETURN
51195   REM
51200   REM  ********************************
51205   REM
```

Moving the Cursor Right and Left

The right and left arrow subroutines, which are presented below, are very simple. First, the program redisplays the current cursor position in normal video. Next, it increments or decrements PLACE%, and then it displays the new cursor position in inverse video. Notice in the program that follows that both routines test the size of PLACE% and that it is changed only if it meets the boundary condition.

```
51380   REM  LEFT ARROW
51385   REM
51390   GOSUB 52070               : REM  DISPLAY NORMAL
51395   IF PLACE% > 1 THEN PLACE% = PLACE% - 1: REM  MOVE LEFT ONE
51400   GOSUB 52000               : REM  DISPLAY INVERSE
51405   RETURN
51410   REM
51415   REM  ***********************************
51420   REM
51425   REM  RIGHT ARROW
51430   REM
51435   IF MID$ (ENTRY$,PLACE%,1) = "" THEN RETURN
51440   GOSUB 52070               : REM  DISPLAY AS NORMAL
51445   IF PLACE% < MAXSIZE% THEN PLACE% = PLACE% + 1
51450   GOSUB 52000               : REM  DISPLAY AS INVERSE
51455   RETURN
51460   REM
51465   REM  ******************************
51470   REM
```

TEST POINT

Enter some text, then enter the left arrow. The cursor should move left one position each time you strike the key. Continue striking the left arrow key until you have returned to the beginning of the field. Now strike the left arrow a couple of times just to make sure it works properly in the first character position. Test the right arrow by striking it until you have gone to the end of the field.

Jump to the Next Word

Skipping to the next word on the line moves the cursor to the first character of the next word, to the right of the current cursor position. To do this operation, the program looks at each character to the right of the cursor and stops at the first one *after* the next space or group of spaces. If the cursor is positioned over a word, then it must move right to the first space and then over the spaces to the first nonspace.

The following routine allows the user to skip to the next word:

```
51475   REM  SKIP TO NEXT WORD
51480   REM
51485   REM
51490   IF PLACE% = > TXTSIZE% THEN RETURN : REM  ALREADY AT END
51495   GOSUB 52070                 : REM  REMOVE CURSOR
51500   PLACE% = PLACE% + 1         : REM  LOOK FOR FIRST SPACE
51505   IF PLACE% = TXTSIZE% THEN GOTO 51530
51510   IF MID$ (ENTRY$,PLACE%,1) < > " " THEN GOTO 51500: REM  IS IT A SPACE?
51515   PLACE% = PLACE% + 1         : REM  MOVE RIGHT ONE
51520   IF PLACE% = TXTSIZE% THEN GOTO 51530
51525   IF MID$ (ENTRY$,PLACE%,1) = " " THEN GOTO 51515: REM  SKIP OVER SPACES
51530   GOSUB 52000                 : REM  DISPLAY CURSOR
51535   RETURN
51540   REM
51545   REM  ******************************
51550   REM
```

TEST POINT

Enter the sentence:

```
"THIS IS A TEST."
```

Now use the left arrow to move to the front of the line. Enter a ^W and the cursor should jump to the front of the next word. Try this exercise with several sentences and vary the number of spaces between words.

Jump to the Previous Word

To skip to the previous word, we first want to force the cursor to move over any spaces, in case we are at the front of a word, and then stop at the character to the right of the next space. The following program performs the skip to the previous word:

```
51555   REM  SKIP TO PREVIOUS WORD
51560   REM
51565   IF PLACE% = 1 THEN RETURN : REM  AT THE FRONT ALREADY
51570   GOSUB 52070               : REM  REMOVE CURSOR
```

```
51575   PLACE% = PLACE% - 1        : REM  LOOK FOR SPACE
51580   IF PLACE% = 1 THEN GOTO 51610: REM  FORCE MOVE AT LEAST ONE SPACE
51585   IF MID$(ENTRY$,PLACE%,1) = " " THEN GOTO 51575: REM  SKIP OVER SPACES
51590   PLACE% = PLACE% - 1
51595   IF PLACE% = 1 THEN GOTO 51610
51600   IF MID$(ENTRY$,PLACE%,1) < > " " THEN GOTO 51590: REM  IS IT A SPACE?
51605   PLACE% = PLACE% + 1        : REM  POSITION OVER FIRST LETTER
51610   GOSUB 52000                : REM  DISPLAY THE CURSOR
51615   RETURN
51620   REM
51625   REM  ******************************
```

TEST POINT

Enter the sentence:

```
"PREVIOUS WORD TEST."
```

Then enter a ^A and the cursor should move left one word. Repeat the tests you just did for jumping to the next word.

Jump to End of Line

We can skip to the end of the line by testing the length of the field and moving the cursor there. The following program gives the routine:

```
51680   REM  SKIP TO END OF LINE
51685   REM
51690   GOSUB 52070                : REM  MOVE THE CURSOR
51695   PLACE% = LEN (ENTRY$) + 1
51700   IF PLACE% > MAXSIZE% THEN PLACE% = MAXSIZE%: REM  DO NOT GO PAST END
51705   GOSUB 52000                : REM  SHOW THE CURSOR
51710   RETURN
51715   REM
51720   REM  ********************
51725   REM
```

TEST POINT

After you enter some text, move the cursor left and enter ^N. The cursor should jump to the end of the line.

Deleting a Character

The delete subroutine uses MID$ and LEFT$ commands to compress the field, and then it displays the new text with the cursor. In the delete program that follows you will note that there are several conditional tests. These tests check for special circumstances at the boundaries of the subroutine. Many routines require special handling at the minimum or maximum points of the routine. In this case the special handling is needed when the cursor is at the very beginning or end of the field.

As you develop programs, you should carefully design and test the boundaries or extremes of the routine, because most errors will occur at the boundaries and not in the middle range of a routine. For example, filling a disk or initializing a file are common boundary conditions that can cause problems. While you may not always be able to think of every possible error condition, you can generally think of the limits of a routine so that they can be tested.

The delete subroutine is as follows:

```
51210   REM  DELETE AND PACK
51215   REM
51220   TXTSIZE% = LEN (ENTRY$)
51225   IF TXTSIZE% = 0 THEN RETURN : REM  NOTHING TO DELETE
51230   IF TXTSIZE% = 1 THEN ENTRY$ = "":PLACE% = 1:GOTO 51250: REM  DELETE LINE
51235   IF PLACE% = 1 THEN ENTRY$ = MID$ (ENTRY$,2): GOTO 51250
51240   IF PLACE% > = TXTSIZE% THEN
           ENTRY$ = LEFT$(ENTRY$,TXTSIZE% - 1):PLACE% = PLACE% - 1:GOTO 51250
51245   ENTRY$ = LEFT$ (ENTRY$,(PLACE% - 1)) + MID$ (ENTRY$,PLACE% +1)
51250   GOSUB 52130              : REM  PRINT NEW STRING
51255   GOSUB 52000              : REM  PRINT INVERSE
51260   RETURN
51265   REM
51270   REM  ******************************
51275   REM
```

TEST POINT

At this point you should be able to enter text and move the cursor back and forth. To test the delete routine, enter some text and then delete a character at the following positions:

1. Cursor on the first character,
2. Cursor in middle of text,
3. Cursor on last character,
4. Cursor past end of text.

Inserting Characters

Characters are inserted by an insert mode toggle. In other words, we turn, or toggle, the insert mode on or off. The control F key is used to turn the mode on, and this or any other control key can be used to turn the mode off.

Once the insert mode is turned on, any regular characters typed will be inserted into the field, with any characters to the right of the cursor being shifted to the right one place for each character inserted. Any characters at the very end of the field will spill off into that never-never land of lost characters.

The actual insertion is done by first inserting a space into the field and printing the line. Next, the desired character is written over this space. Finally, the cursor is moved right one place. The LEFT$ command is essential in this routine.

**LEFT$** The LEFT$(A$,N) command returns the character string starting at the left end of A$ for N characters.

EXAMPLE

```
5000 A$ = "HAPPY DAYS"
5100 PRINT LEFT$(A$,4)
RUN
HAPP
```

In this example of LEFT$ we take the character in A$ starting at the leftmost position and count to the right four positions and stop. In this case the results are HAPP.

Any characters pushed off the end of the field are lost. A variation you could implement is to allow insertion only until the field is full and then stop. If users did not want the characters at the end, they would have to move the cursor there and erase them.

The program for inserting characters is as follows:

```
51280   REM  TOGGLE THE INSERT MODE
51285   REM
51290   IF INSERT% = 1 THEN INSERT% = 0: RETURN : REM  TURN IT OFF
51295   INSERT% = 1                : REM  TURN IT ON
51300   RETURN
51305   REM  *********************************
51310   REM
51315   REM  INSERT A SPACE
51320   REM
51325   REM
51330   REM  IS IT THE FIRST CHARACTER?
51335   IF PLACE% = 1 THEN ENTRY$ = " " + ENTRY$: GOTO 51350
51340   REM  INSERT IN THE MIDDLE
51345   ENTRY$ = LEFT$ (ENTRY$,PLACE% - 1) + " " + MID$ (ENTRY$,PLACE%)
51350   GOSUB 52130                : REM  PRINT THE FIELD
51355   GOSUB 52070                : REM  REPOSITION CURSOR
51360   RETURN
51365   REM
51370   REM  *********************************
51375   REM
```

TEST POINT

Begin by entering some text on the line and moving the cursor into the middle of the text. Now enter ^F followed by some other letters. As each character is entered, the text should split, with the right side sliding right one place for each new character entered. The cursor should step right one place. Press another control key—left arrow, for example—and make sure that the insert mode is turned off. Next, toggle insert mode back on and verify that a second ^F turns it off. Finally, move the cursor to the front of the text and check that the insert mode works there.

Displaying a Character

After a valid key has been pressed, the following display subroutine will display the character on the screen. If a character has been removed, then the FILL$ character will be displayed.

```
52070   REM  POSITION AND DISPLAY NORMAL
52075   REM
52077   VTAB ROW% : REM  POSITION CURSOR
52080   POKE 36, (COL% + PLACE% - 1) : REM  HTAB
52085   XX$ = MID$ (ENTRY$,PLACE%,1) : REM  PRINT ONE LETTER
52090   IF XX$ = "" THEN XX$ = FILL$ : REM  IF NULL THEN MAKE IT A SPACE
52095   PRINT XX$;
52100   REM
52105   POKE 36, (COL% + PLACE% - 1) : REM  REPOSITION THE CURSOR - HTAB
52110   RETURN
52115   REM
52120   REM  *********************************
52125   REM
```

TEST POINT

The display subroutine is tested in conjunction with the character-accept and display routine. RUN the program and press a key. This key's character should be displayed on the screen in a NORMAL video, and the cursor should move one position to the right.

Erase to End of Line

This erase feature is very handy. You will frequently decide to change everything to the right of the cursor, and the erase routine allows you to do so in one keystroke. Erasing to the end of the line only requires a LEFT$ command and then a redisplay of the field.

```
51630   REM  ERASE TO END OF LINE
51635   REM
51640   IF PLACE% = 1 THEN ENTRY$ = "":GOTO 51650: REM  ERASE WHOLE LINE
51645   ENTRY$ = LEFT$ (ENTRY$,PLACE% - 1)
51650   GOSUB 52130              : REM  PRINT THE FIELD
51655   GOSUB 52000              : REM  DISPLAY THE CURSOR
51660   RETURN
51665   REM
51670   REM  *********************************
51675   REM
```

TEST POINT

Enter some text and move the cursor left. Now enter ^Y and everything to the right of the cursor should disappear. Test this routine at the beginning, the middle, and the end of the line.

The Escape Key

Striking the ESC (escape) key will cause the CTRL% flag to be set and the line editor to return to the calling program. This feature is used extensively later in the book.

USER INSTRUCTIONS

Whenever it is appropriate, we will include a sample set of instructions that can be included in your user's (operator's) manual. We naturally are assuming that every program that you write includes a user's manual. Portions of the user's manual can be extracted and used as help files.

The line editor program allows you to enter and edit text. You can move the cursor left and right, insert and delete characters anywhere on the line, and request help from the computer.

The line editor will check every character that you enter and verify that it is acceptable. For example, if the program is requesting a number, then it will allow you to enter only numbers, not letters. When it wants a yes or no response, it will only allow you to enter a Y or an N. Periods (.) are displayed to illustrate the maximum length of the field. You cannot enter text that will exceed the space shown.

Whenever you have any doubts about how you should respond to an input, you can request help by pressing control Q (for question). If help is available, then a message will be displayed for you. After you have read the message, enter RETURN and the program will continue.

The following list summarizes the editing commands available. Recall that a control character is entered by holding down the CTRL key while entering the desired letter. For example, control A is activated by holding down the CTRL key while striking the A key.

Control A	Skip to the previous word.
Control D	Delete this character and compress the line.
Control F	Insert characters into the line.
Control N	Skip to the end of the line.
Control Q	HELP request at any time.
Control W	Skip to the next word.
Control Y	Erase to the end of the line.
Right arrow	Move right one character.
Left arrow	Move left one character.

When you are in the insert mode, you will keep inserting letters until you enter any control or arrow key.

COMPLETE LINE EDITOR PROGRAM

The complete program listing for the line editor follows. It may look like a formidable program, but if the remark statements were removed, the program would be about 160 lines long. Considering what this routine does, that length is not overly long.

```
10      REM
20      REM  LINE EDITOR TEST ROUTINE
30      REM  ASKS FOR INITIAL CONDITIONS THEN IT
40      REM  USES THE LINE EDITOR.
50      REM
60      HOME
70      INPUT "ENTER MASK ";MASK$
80      INPUT "ENTER TEXT ";ENTRY$
90      INPUT "ENTER ROW  ";ROW%
100     INPUT "ENTER COL  ";COL%
110     HOME
120     GOSUB 50000 : REM  THE LINE EDITOR
130     VTAB 20
140     PRINT
150     IF HELP% = 1 THEN PRINT "HELP REQUESTED"
```

```
160     PRINT
170     PRINT ">";ENTRY$;"<"
180     VTAB 24
190     INPUT "ENTER (CR) TO CONTINUE OR END TO EXIT ";A$
200     IF A$ < > "" THEN END
210     GOTO 60
220     REM
230     END

50000   REM  BASIC LINE EDITOR
50005   REM
50010   REM
50015   REM  THIS IS A BASIC LINE EDITOR
50020   REM
50025   REM THE PROGRAMMER CALLS IT USING THE FOLLOWING VARIABLES
50030   REM
50035   REM  ROW% => SCREEN LINE NUMBER
50040   REM  COL% => SCREEN COLUMN NUMBER
50045   REM  ENTRY$ => TEXT TO BE EDITED
50050   REM  MASK$ => DATA TYPE TO BE ALLOWED
50055   REM  WHERE:
50060   REM    A = ALPHANUMERIC
50065   REM    # = NUMBER FIELD ONLY
50070   REM    Y = YES/NO FIELD
50075   REM    Q = HELP REQUEST OK, USE IN ANY CHARACTER
50080   REM  THE LENGTH OF MASK$ IS THE MAXIMUM LENGTH OF THE
50085   REM  INPUT  STRING
50090   REM
50095   REM
50100   PLACE% = 1              : REM  SET THE STARTING POSITION
50105   REM
50110   FILL$ = "."             : REM  DISPLAY DOTS
50115   HELP% = 0               : REM  CLEAR THE HELP FLAG
50120   CTRL% = 0               : REM  CLEAR THE EXIT FLAG
50125   GOSUB 52130             : REM  DISPLAY ENTRY$
50130   GOSUB 50165             : REM  EDIT THE STRING
50135   FILL$ = " "             : REM  CLEAR THE SCREEN
50140   GOSUB 52130             : REM  DISPLAY ENTRY$
50145   RETURN                  : REM  GO BACK TO CALLER
50150   REM
50155   REM  **********************
```

```
50160   REM
50165   REM  EDIT THE ENTRY$ FIELD
50170   REM
50175   REM  POSITION THE CURSOR
50180   REM
50185   VTAB ROW%               : REM  VERTICAL POSITION
50190   GOSUB 52000             : REM  PRINT THE CHARACTER IN INVERSE
50195   REM
50200   REM  ACCEPT A KEY FROM THE KEYBOARD
50205   REM
50210   KEY% = PEEK (49152)     : REM  TEST FOR INPUT
50215   IF KEY% < 128 THEN GOTO 50210 : REM  LOOP UNTIL ENTRY
50220   REM
50225   REM  IF HERE THEN A KEY PUSHED
50230   REM
50235   XX = PEEK (49168)       : REM  CLEAR KEYBOARD
50240   KEY% = KEY% - 128       : REM  STRIP OFF FLAG BIT
50245   REM
50250   REM  PROCESS THE KEY
50255   REM
50260   GOSUB 50295             : REM  KEY% PROCESSOR
50265   IF HELP% > 0 THEN RETURN : REM  HELP REQUESTED BY USER
50270   IF CTRL% > 0 THEN GOSUB 52070: RETURN : REM  CONTROL KEY EXIT
50275   GOTO 50210              : REM  GET THE NEXT KEY
50280   REM
50285   REM  ****************************
50290   REM
50295   REM  TEST FOR CONTROL KEY
50300   REM
50305   IF KEY% < = 31 THEN GOSUB 51000: RETURN : REM  PROCESS AND RETURN
50310   REM
50315   REM  MUST BE AN ALPHANUMERIC
50320   REM
50325   REM  TEST THE MASK TO DETERMINE DATA TYPE
50330   REM
50335   IF MID$ (MASK$,PLACE%,1) = "A" THEN GOSUB 50900: RETURN
50340   IF MID$ (MASK$,PLACE%,1) = "#" THEN GOSUB 50390: RETURN
50345   IF MID$ (MASK$,PLACE%,1) = "Y" THEN GOSUB 50440: RETURN
50355   REM
50360   REM  BAD MASK CHARACTER
50365   REM
```

```
50370   RETURN
50375   REM
50380   REM  ******************************
50385   REM
50390   REM  ACCEPT A NUMBER
50395   REM
50400   REM  TEST TO SEE IF IT IS A VALID NUMERIC TYPE OF CHARACTER
50405   REM
50410   IF (KEY% < 45) OR (KEY% > 57) THEN RETURN : REM  BAD KEY
50415   IF KEY% = 47 THEN RETURN : REM  BAD KEY ALSO
50420   GOSUB 50900              : REM  GOOD KEY SO ACCEPT IT
50425   RETURN
50430   REM  ******************************
50435   REM
50440   REM  TEST FOR YES OR NO
50445   IF (KEY% < > 89) AND (KEY% < > 78) THEN RETURN : REM  BAD  KEY
50450   GOSUB 50900                          : REM  ACCEPT IT
50455   RETURN
50460   REM  ******************************
50465   REM
50900   REM  PRINT KEY% AND ADD TO ENTRY$
50905   REM
50910   IF INSERT% = 1 THEN GOSUB 51315: REM  INSERT A SPACE
50915   TXTSIZE% = LEN (ENTRY$) : REM  MAKE SURE WE HAVE CORRECT TXTSIZE%
50922   REM  ADD TO END OF ENTRY
50925   IF PLACE% > TXTSIZE% THEN ENTRY$ = ENTRY$ + CHR$ (KEY%): GOTO 50945
50926   REM  ADD AS FIRST CHARACTER
50930   IF PLACE% = 1 THEN ENTRY$ = CHR$(KEY%) + MID$(ENTRY$,PLACE% + 1): GOTO 50945
50932   REM  ADD AS LAST CHARACTER
50935   IF PLACE% = TXTSIZE% THEN
          ENTRY$ = LEFT$(ENTRY$,PLACE% - 1) + CHR$(KEY%): GOTO 50945
50936   REM  ADD IN THE MIDDLE SOMEWHERE
50940   ENTRY$ = LEFT$(ENTRY$,PLACE% - 1) + CHR$(KEY%) + MID$(ENTRY$,PLACE% + 1)
50945   TXTSIZE% = LEN (ENTRY$)
50946   REM  IF TOO BIG TRUNCATE IT
50950   IF TXTSIZE% > MAXSIZE% THEN ENTRY$ = LEFT$ (ENTRY$,MAXSIZE%)
50955   REM
50960   REM  NEED TO MOVE RIGHT ONE PLACE
50965   REM
50970   GOSUB 51425              : REM  RIGHT ARROW
50975   RETURN
```

```
50980   REM
50985   REM  ***************************
50990   REM
51000   REM  PROCESS A CONTROL KEY
51005   REM
51010   REM  EXIT KEYS SUCH AS RETURN SET CTRL%
51015   REM
51020   REM
51025   REM  ^A = 1  > PREVIOUS WORD
51030   REM  ^D = 4  > DELETE THIS CHARACTER
51035   REM
51040   REM  ^F = 6  > FILL WITH A SPACE
51045   REM  ^H = 8  > LEFT ARROW
51050   REM  ^N = 14 > SKIP TO END
51055   REM  ^Q = 17 > HELP REQUEST
51060   REM  ^U = 21 > RIGHT ARROW
51065   REM  ^W = 23 > NEXT WORD
51070   REM  ^Y = 25 > ERASE TO END
51075   REM  IGNORE ALL OTHER KEYS
51080   REM
51085   CTRL% = 0                    : REM  CLEAR EXIT FLAG
51090   IF KEY% = 6 THEN GOSUB 51280: RETURN : REM  INSERT
51095   INSERT% = 0                  : REM  TURN INSERT OFF
51100   IF KEY% = 1 THEN GOSUB 51555: REM  PREVIOUS WORD
51105   REM
51110   IF KEY% = 4 THEN GOSUB 51210: REM  DELETE
51115   REM
51120   IF KEY% = 8 THEN GOSUB 51380: REM  LEFT ARROW
51125   REM
51130   IF KEY% = 13 THEN CTRL% = 1: REM  RETURN KEY
51135   REM  CHECK HELP REQUEST
51140   IF KEY% = 17 THEN HELP% = 1 : RETURN : REM  HELP REQUEST
51145   REM
51150   IF KEY% = 14 THEN GOSUB 51680: REM  GOTO END
51155   REM
51160   IF KEY% = 21 THEN GOSUB 51425: REM  RIGHT ARROW
51165   REM
51170   IF KEY% = 23 THEN GOSUB 51475: REM  NEXT WORD
51175   REM
51180   IF KEY% = 25 THEN GOSUB 51630: REM  ERASE TO END
51184   IF KEY% = 27 THEN CTRL% = 27 : RETURN : REM  ESC
```

```
51185  REM
51190  RETURN
51195  REM
51200  REM  ******************************
51205  REM
51210  REM  DELETE AND PACK
51215  REM
51220  TXTSIZE% = LEN (ENTRY$)
51225  IF TXTSIZE% = 0 THEN RETURN : REM  NOTHING TO DELETE
51230  IF TXTSIZE% = 1 THEN ENTRY$ = "":PLACE% = 1:GOTO 51250: REM  DELETE LINE
51235  IF  PLACE% = 1 THEN ENTRY$ = MID$ (ENTRY$,2): GOTO 51250
51240  IF PLACE% > = TXTSIZE% THEN
         ENTRY$ = LEFT$(ENTRY$,TXTSIZE% - 1):PLACE% = PLACE% - 1:GOTO 51250
51245  ENTRY$ = LEFT$ (ENTRY$,(PLACE% - 1)) + MID$ (ENTRY$,PLACE% + 1)
51250  GOSUB 52130          : REM  PRINT NEW STRING
51255  GOSUB 52000          : REM  PRINT INVERSE
51260  RETURN
51265  REM
51270  REM  ******************************
51275  REM
51280  REM  TOGGLE THE INSERT MODE
51285  REM
51290  IF INSERT% = 1 THEN INSERT% = 0: RETURN : REM  TURN IT OFF
51295  INSERT% = 1          : REM  TURN IT ON
51300  RETURN
51305  REM  ******************************
51310  REM
51315  REM  INSERT A CHARACTER
51320  REM
51325  REM
51330  REM  IS IT THE FIRST CHARACTER?
51335  IF  PLACE% = 1 THEN ENTRY$ = " " + ENTRY$: GOTO 51350
51340  REM  INSERT IN THE MIDDLE
51345  ENTRY$ = LEFT$ (ENTRY$,PLACE% - 1) + " " + MID$ (ENTRY$,PLACE%)
51350  GOSUB 52130          : REM  PRINT THE FIELD
51355  GOSUB 52070          : REM  REPOSITION CURSOR
51360  RETURN
51365  REM
51370  REM  ******************************
51375  REM
```

```
51380  REM  LEFT ARROW
51385  REM
51390  GOSUB 52070        : REM  DISPLAY NORMAL
51395  IF PLACE% > 1 THEN PLACE% = PLACE% - 1: REM  MOVE LEFT ONE
51400  GOSUB 52000        : REM  DISPLAY INVERSE
51405  RETURN
51410  REM
51415  REM  ******************************
51420  REM
51425  REM  RIGHT ARROW
51430  REM
51435  IF MID$ (ENTRY$,PLACE%,1) = "" THEN RETURN
51440  GOSUB 52070        : REM  DISPLAY AS NORMAL
51445  IF PLACE% < MAXSIZE% THEN PLACE% = PLACE% + 1
51450  GOSUB 52000        : REM  DISPLAY AS INVERSE
51455  RETURN
51460  REM
51465  REM  ******************************
51470  REM
51475  REM  SKIP TO NEXT WORD
51480  REM
51485  REM
51490  IF PLACE% = > TXTSIZE% THEN RETURN : REM  ALREADY AT END
51495  GOSUB 52070        : REM  REMOVE CURSOR
51500  PLACE% = PLACE% + 1: REM  LOOK FOR FIRST SPACE
51505  IF PLACE% = TXTSIZE% THEN GOTO 51530
51510  IF MID$ (ENTRY$,PLACE%,1) < > " " THEN GOTO 51500: REM  IS IT A SPACE?
51515  PLACE% = PLACE% + 1: REM  MOVE RIGHT ONE
51520  IF PLACE% = TXTSIZE% THEN GOTO 51530
51525  IF MID$ (ENTRY$,PLACE%,1) = " " THEN GOTO 51515: REM  SKIP OVER SPACES
51530  GOSUB 52000        : REM  DISPLAY CURSOR
51535  RETURN
51540  REM
51545  REM  ******************************
51550  REM
51555  REM  SKIP TO PREVIOUS WORD
51560  REM
51565  IF PLACE% = 1 THEN RETURN : REM  AT THE FRONT ALREADY
51570  GOSUB 52070        : REM  REMOVE CURSOR
51575  PLACE% = PLACE% - 1: REM  LOOK FOR SPACE
51580  IF PLACE% = 1 THEN GOTO 51610: REM  FORCE MOVE AT LEAST ONE SPACE
```

```
51585  IF MID$(ENTRY$,PLACE%,1) = " " THEN GOTO 51575: REM  SKIP OVER SPACES
51590  PLACE% = PLACE% - 1
51595  IF PLACE% = 1 THEN GOTO 51610
51600  IF MID$(ENTRY$,PLACE%,1) < > " " THEN GOTO 51590: REM  IS IT A SPACE?
51605  PLACE% = PLACE% + 1 : REM  POSITION OVER FIRST LETTER
51610  GOSUB 52000         : REM  DISPLAY THE CURSOR
51615  RETURN
51620  REM
51625  REM  ******************************
51630  REM  ERASE TO END OF LINE
51635  REM
51640  IF PLACE% = 1 THEN ENTRY$ = "": GOTO 51650: REM  ERASE WHOLE LINE
51645  ENTRY$ = LEFT$ (ENTRY$,PLACE% - 1)
51650  GOSUB 52130         : REM  PRINT THE FIELD
51655  GOSUB 52000         : REM  DISPLAY THE CURSOR
51660  RETURN
51665  REM
51670  REM  ******************************
51675  REM
51680  REM  SKIP TO END OF LINE
51685  REM
51690  GOSUB 52070         : REM  MOVE THE CURSOR
51695  PLACE% = LEN (ENTRY$) + 1
51700  IF PLACE% > MAXSIZE% THEN PLACE% = MAXSIZE%: REM  DO NOT GO PAST END
51705  GOSUB 52000         : REM  SHOW THE CURSOR
51710  RETURN
51715  REM
51720  REM  ******************************
51725  REM
52000  REM  PRINT CHARACTER IN INVERSE
52005  REM  THIS GIVES THE ILLUSION OF CURSOR MOVEMENT
52010  REM
52012  VTAB ROW% : REM  POSITION CURSOR
52015  POKE 36, (COL% + PLACE% - 1) : REM  HTAB
52020  INVERSE             : REM  REVERSE VIDEO
52025  XX$ = MID$ (ENTRY$,PLACE%,1): REM  MOVE FOR THE NEXT IF
52030  IF XX$ = "" THEN XX$ = " ": REM  IF NULL MAKE IT A SPACE
52035  PRINT XX$;                : REM  PRINT THE INVERSE
52040  NORMAL                    : REM  RESTORE TO NORMAL VIDEO
52045  POKE 36, (COL% + PLACE% - 1) : REM  REPOSITION THE CURSOR - HTAB
52050  RETURN
```

```
52055 REM
52060 REM  ******************************
52065 REM
52070 REM  POSITION AND DISPLAY NORMAL
52075 REM
52077 VTAB ROW% : REM  POSITION CURSOR
52080 POKE 36, (COL% + PLACE% - 1) : REM  HTAB
52085 XX$ = MID$ (ENTRY$,PLACE%,1) : REM  PRINT ONE LETTER
52090 IF XX$ = "" THEN XX$ = FILL$ : REM  IF NULL THEN MAKE IT A SPACE
52095 PRINT XX$;
52100 REM
52105 POKE 36, (COL% + PLACE% - 1) : REM  REPOSITION THE CURSOR
52110 RETURN
52115 REM
52120 REM  ******************************
52125 REM
52130 REM  DISPLAY TEXT$
52135 REM  FILL$ IS THE FILL CHARACTER
52140 REM  TXTSIZE% IS THE LENGTH OF ENTRY$
52145 REM  MAXSIZE% IS THE MAXIMUM ALLOWED LENGTH
52150 REM
52155 REM
52160 TXTSIZE% = LEN (ENTRY$)  : REM  HOW LONG IS THE CURRENT FIELD?
52165 MAXSIZE% = LEN (MASK$)   : REM  WHAT IS MAX LENGTH ALLOWED?
52170 REM
52175 REM  IS ENTRY$ TOO LONG?
52180 REM
52185 IF TXTSIZE% > MAXSIZE% THEN
        ENTRY$ = LEFT$ (ENTRY$,MAXSIZE%):TXTSIZE% = MAXSIZE%
52190 REM
52195 REM  POSITION THE CURSOR
52200 REM
52205 VTAB ROW%                : REM  ROW POSITION
52210 POKE 36, COL%            : REM  COLUMN NUMBER - HTAB
52215 REM
52220 REM  PRINT THE TEXT
52225 REM
52230 PRINT ENTRY$;            : REM  NO LINE FEED
52235 REM
52240 REM  PRINT THE FILL CHARACTER
52245 REM
```

```
52250   IF TXTSIZE% = MAXSIZE% THEN RETURN : REM  NO FILL$ TO PRINT
52255   FOR XX = TXTSIZE% TO MAXSIZE% - 1
52260   PRINT FILL$;
52265   NEXT XX
52270   RETURN                    : REM  ALL DONE
52275   REM
52280   REM  ******************************
52285   REM
60000   RETURN          : REM  UNIVERSAL RETURN FOR TESTING
```

SCREEN TEXT EDITOR

INTRODUCTION

In the previous chapter we created a line editor capable of editing a single line of text. Often, however, it is necessary to enter and edit a paragraph or more of text. In this chapter we will develop a screen text editor that will enable us to enter and edit many pages of text. This program will be developed in two parts. The first part is the actual text editor that can be added to your own programs. The second part provides disk input/output capability. By combining both parts, you will have a stand-alone, text-editing and program development system.

Before we present part 1 of the program, we will discuss the design and the features of the text editor and the complete text editor.

Design

This program is going to be a multipurpose text editor. Not only do we want to be able to edit text as part of a program, but we also want to develop a stand-alone text editor that can be used for writing letters or computer programs. Thus our program supports both purposes.

Another design feature of the program is the output to the printer portion of the program, which may require special commands to be passed depending on the type of printer used. One of the most popular makes, the Epson, requires the code CONTROL I 80 N to be sent to the printer to initialize it before printing more than 40 columns (many other makes also have this requirement). The "80" can be any number between 1 and 255 or the limit of the printer, whichever is smaller. The most common value used is 80. Many special features such as different character fonts and bold printing are possible. See your printer manual for the special codes it requires.

In part 2 we will add to the text editor, giving the complete editor a *command* area. In this area the user is given the option to print, load, save, auto number, or quit.

Building the Program

The heart of the text editor is the line editor developed in Chapter 2. To build the screen text editor, start with a copy of the line editor program from Chapter 2 and add the additional program lines presented in this chapter. Be sure to make backups at each stage of entry and each time you successfully get through a test point.

User Features

To edit several pages of text, the user must be able to move the cursor up and down a line or a page of text at a time and insert or delete lines. These features are incorporated in the text editor.

Also, you may have noticed that your Apple II screen is only 40 characters wide (this limitation also applies to the Apple IIe with the 80-column card deactivated or off), but most printers are 80 or more

characters wide. Since it would be very nice to be able to print a document wider than 40 characters, we include in our program a line continuation (wraparound) feature that allows us to combine several lines into one. However, in entering text, the user will have to enter a CR at the end of each line; the editor will not do wraparound on the screen.

For a stand-alone text editor we also need to be able to send text to the printer, to load and save text files to the disk, or to quit and forget everything entered. These features are included in our program and are presented in detail in the part 2 discussion. The following list gives the commands, and their explanations, for these additional features. The commands consist of a complete word followed, in some commands, by a disk file name or number. The command words are as follows:

LOAD FN	Load disk file called FN.
CATALOG	Display directory.
SAVE FN	Save text to disk file called FN.
DONE FN	Save text and then QUIT.
PACK FN	Concatenate and save the text file and then QUIT.
AUTO #	Turn auto line numbering on or off.
AUTO	Turn auto line numbering off.
EDIT #	Edit the text starting at line number #.
EDIT or ESC key	Return to current page in text editor.
PRINT	Print text file.
FORMAT	Pack and print text file.
QUIT	Return to BASIC and clear the array.

For example, to load and then edit a text file called SALES LETTER, the user would enter

```
LOAD SALES LETTER
```

After the file is loaded, the user could enter either

```
EDIT or EDIT 1 or ESC
```

to begin editing on line 1.

Programmer Features

So that the text editor can be used as a program development tool, the only additional feature needed is auto line numbering, which we have included.

From a programming standpoint all text is kept in a string array. The calling program must tell the editor how large the array is, what line to begin editing on, and the number of the last array element that contains a valid text field.

For part 2, the complete text editor, the programmer must decide how many lines the LINE$ array should contain. In a 48K system 1000 lines are a good choice. This choice will allow the average line to be about 24 characters long. The same choice applies to the 64K Apple //e, since the additional memory is not available for use by a BASIC program.

PART 1: TEXT EDITOR PROGRAM

The flowchart for the basic text editor is shown in Fig. 3.1. This flowchart says that the calling program defines the starting conditions; then the text editor displays a screen of text and edits the first line of text. After the line is edited, it tests to see if the user is done. If the user is not done, the text editor will process the last command. To leave the line editor, the user has to enter either a control character (a RETURN is control M), or an ESCape. Depending on the key entered, the text editor will either move up/down a line/page of text or insert/delete a line.

The program corresponding to the flowchart in Fig. 3.1 (page 66) is as follows:

```
41000   REM  TEXT EDITOR
41005   REM
41010   REM       VARIABLE DEFINITION
41015   REM  LROW%     STARTING ROW NUMBER
41020   REM  LCOL%     STARTING COL NUMBER
41025   REM  LINE$()   TEXT ARRAY
41030   REM  LAST%     DIMENSIONS OF TEXT ARRAY
41035   REM  MLINE%    LARGEST LINE USED IN ARRAY
41040   REM  LINE%     CURRENT LINE BEING EDITED
41045   REM  FIRST%    LINE AT TOP OF SCREEN
```

```
41050   FILL$ = " "                 : REM  DEFINE THE FILL CHARACTER
41055   GOSUB 41800                 : REM  DISPLAY THE SCREEN
41060   ROW% = LROW%                : REM  START AT LAST ROW
41065   COL% = LCOL%                : REM  START AT LAST COL
41070   REM
41075   REM  TOP OF EDIT LOOP
41080   CTRL% = 0: REM  CLEAR THE EXIT FLAG
41085   ENTRY$ = LINE$(LINE%): REM  PUT CURRENT LINE INTO LINE EDITOR
41090   IF PLACE% > LEN (ENTRY$) THEN PLACE% = LEN (ENTRY$) + 1: REM
          ASSIGN PLACE% HERE
41095   IF PLACE% = 0 THEN PLACE% = 1: REM  NULL LINE
41100   GOSUB 50165: REM  EDIT THE TEXT BUT DO NOT REDISPLAY ENTRY$
41105   LINE$(LINE%) = ENTRY$     : REM  SAVE THE EDITED LINE
41110   IF KEY% = 27 THEN LROW% = ROW%:LCOL% = COL%: RETURN : REM  BACK TO CALLER
41115   ON CTRL% GOSUB 41130,41165,41215,41635,41675,
          41735,41490,41560,41435,41320,41370 : REM  PROCESS KEY
41120   GOTO 41075
41125   REM  ************************************
41130   REM
```

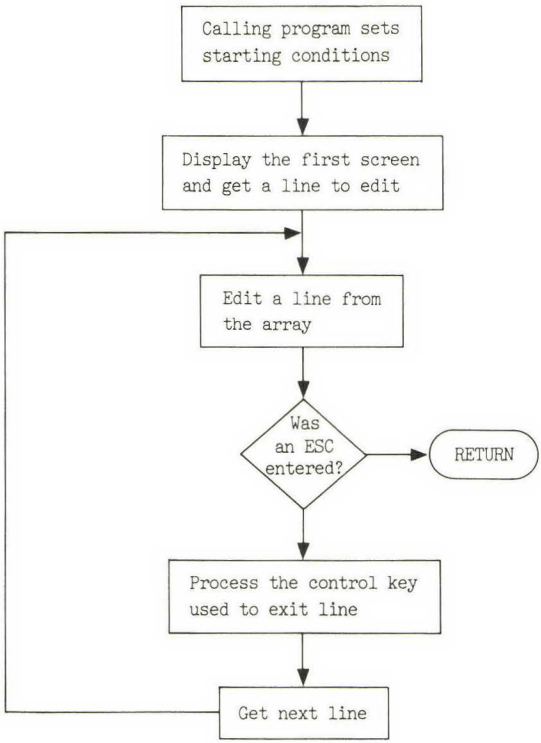
The following subsections describe various aspects of the text editor program.

TEST POINT

Enter the following program lines. They will be used later to test the screen editor.

```
100   REM
110   REM  SCREEN EDITOR TEST ROUTINE
120   REM
130   DIM LINE$(50)                 REM  DEFINE SCREEN ARRAY
140   LAST% = 50                    REM  NUMBER OF TEXT LINES
150   MLINE% = 0                    REM  INITIALIZE VARIABLES
160   ANUM% = 0
170   LROW% = 1
180   LCOL% = 1
190   LINE% = 1
200   FIRST% = 1
500   REM
```

FIG. 3.1 Text editor flowchart




```
510   REM  LEAVE A GAP HERE
520   REM
530   GOSUB 41000 : REM  CALL THE EDITOR
590   END
```

Explanation of Variables

The text editor program requires only a few more variables than the line editor. LROW% (line 41060) and LCOL% (line 41065) are used to set the starting position on the screen. The first time the text editor is called, these variables should be set to 1.

The text to be edited is contained in array LINE$( ) (see line 41080). The calling program must either clear (equate to nulls) or fill in the array with text before it calls the text editor. LAST% is the dimension of the array LINE$. For example, LINE$ is dimensioned by the statement DIM LINE$(LAST%), where LAST% is the number of lines in the array.

DIM The DIMension statement is used to allocate space for an array.

EXAMPLE:

```
DIM A(12)
```

This command provides for elements in the array A from position 0 through 12.

MLINE% is the number of the last *used* array element. For instance, if the array is dimensioned to 100, but only the first 23 lines contain information, then MLINE% is set equal to 23 and LAST% is equal to 100. If the array is cleared, then MLINE% is set equal to 1.

LINE% is the number of the line currently being edited. The calling program must set it equal to 1 if there is nothing in the array or if editing is to begin on line 1, the first line. If editing is not to begin on the first line, then LINE% is set equal to the line number to be used. For example, if you wish to begin editing on line 25, you set LINE% equal to 25.

FIRST% is the number of the line to appear at the top of the screen. Normally, FIRST% will start with the same value as LINE%.

ANUM% (line 160 of the test routine) will be used to contain the current auto numbering incremental value. If it is equal to 0, then auto numbering will be turned off.

Explanation of the Program

The text editor routine displays the current screen, keeps track of the cursor's position, and processes the exiting control characters. The text editor enters the line editor routine at line 50170 (see line 41100 of the

text editor program). This GOSUB is used because the text editor does not need to have the line redisplayed before or after editing.

PLACE% (lines 41085 and 41090) is used by the line editor to mark the current character being edited. In the text editor PLACE% is set equal to 1 for a RETURN but not for a line feed or a down arrow. Setting PLACE% equal to 1 will cause the cursor to start at the beginning of the line. If the user desires to use the up and down arrows, it looks nicer and is usually more convenient if the cursor stays in the current column position as the cursor is moved up and down through the lines of text, rather than return to the beginning of the line. If PLACE% is larger than the length of the line the cursor is moving to, PLACE% is set equal to the length of the new line so that editing may begin at the end of the line.

Explanation of Screen Display Subroutine

The screen display subroutine (line 41055, GOSUB 41800) clears the screen by using the HOME command and then uses a FOR-NEXT loop to display the text array, starting with text line FIRST%.

HOME The HOME command clears the text area and moves the cursor to the upper left corner of the screen.

The program for the screen display routine is as follows:

```
41800   REM  DISPLAY THE CURRENT SCREEN
41805   REM
41810   HOME                          : REM  CLEAR THE SCREEN
41815   FOR X = 1 TO 24
41820      Z = FIRST% + X - 1
41825      POKE 36, 1                 : REM  POSITION THE CURSOR - HTAB
41830      VTAB X
41835      PRINT LINE$(Z);
41840   NEXT X
41845   RETURN
41850   REM  ************************************
41855   REM
```

TEST POINT

Before testing the screen display routine, you will need to add a temporary program line:

```
41057   END
```

Since we do not want to proceed past this subroutine, this temporary line will cause execution to stop after the screen is displayed. If you now enter

```
RUN (CR)
```

the screen should clear and the program will stop with the cursor on the last line.

If this routine worked so far, add some more temporary lines:

```
400   FOR X = 1 TO 50
410   LINE$(X) = "THIS IS LINE NUMBER "+STR$(X)
420   NEXT X
```

These lines fill the array with text.

Enter

```
RUN (CR)
```

and you should now see the text for lines 2 through 24 displayed. The text for line 1 scrolled off the top of the screen because of the END statement on line 41057.

After the screen display section is tested, line 41057 is no longer needed, so delete it and add

```
41107   END
```

You can now test the line editor as part of the screen editor. Enter

```
RUN (CR)
```

and the screen should clear, the text in the first 24 lines should be displayed, and the cursor should be left on line 1 over the L. You should now be able to edit this line. The program will stop after you enter (CR).

After you are satisfied that everything is working, delete line 41107.

SCREEN EDITOR CONTROL CHARACTER COMMANDS

The screen text editor requires several new control character commands to be added to the line editor routine. These characters will set the CTRL% variable. Recall that if CTRL% is not 0, the line editor will return to the caller. After the text editor saves the edited line, it will process the exit character.

The following new characters and commands are implemented:

^ B	(control B)	Insert a blank line into array.
^ E	(control E)	Jump to last page.
^ I	(control I)	Tab over 8 spaces or add spaces to a line.
^ J	(control J)	Down arrow, move down one line.
^ K	(control K)	Up arrow, move up one line.
^ M	(control M)	RETURN, move down one line.
^ O	(control O)	Jump to first page of text.
^ P	(control P)	Concatenate two lines of text.
^ R	(control R)	Scroll up one full page of text.
^ T	(control T)	Scroll down one full page of text.
^ Z	(control Z)	Delete a line and compress array.
ESC	(ESCape)	All done. Exit the text editor.

The tests for these commands are inserted directly into the line editor program from Chapter 2 (see the program lines that follow). They must be inserted manually. After the line editor exits, the text editor interprets the CTRL% character and performs the requested action.

The program lines for inserting the new control characters are as follows:

```
50347   IF MID$(MASK$,PLACE%,1) = "N" THEN
          GOSUB 41270: RETURN           : REM  50347     AUTO NUMBER
51102   IF KEY% = 2 THEN CTRL% = 8      : REM  51102 ^B  INSERT LINE
51112   IF KEY% = 5 THEN CTRL% = 9      : REM  51112 ^E  LAST PAGE
51122   IF KEY% = 9 THEN CTRL% = 10     : REM  51122 ^I  TAB
51124   IF KEY% = 10 THEN CTRL% = 2     : REM  51124 ^J  LINE FEED
51126   IF KEY% = 11 THEN CTRL% = 3     : REM  51126 ^K  UP ARROW
51132   IF KEY% = 15 THEN CTRL% = 4     : REM  51132 ^O  FIRST PAGE
51134   IF KEY% = 16 THEN CTRL% = 11    : REM  51134 ^P  CONCATENATE
51142   IF KEY% = 18 THEN CTRL% = 5     : REM  51142 ^R  UP PAGE
51157   IF KEY% = 20 THEN CTRL% = 6     : REM  51157 ^T  DOWN PAGE
51182   IF KEY% = 26 THEN CTRL% = 7     : REM  51182 ^Z  DELETE LINE
```

In the following subsections we will enter and test the new commands.

Inserting a Blank Line

Control B (^B) is used to insert a blank line. To insert a blank line, we split the array at the current line number and move all the text on higher line numbers down one line. After the array is moved, the current line becomes the blank line, MLINE% is incremented, and the screen is redisplayed.

The following routine is used to insert a blank line:

```
41560   REM  INSERT A BLANK LINE
41565   REM
41570   IF MLINE% < LAST% THEN MLINE% = MLINE% + 1
41575   Y = LINE%                   : REM  LINE COUNTER
41580   IF LINE% = 1 THEN Y = 2     : REM  AT TOP OF TEXT
41585   FOR X = MLINE% TO Y STEP - 1
41590      LINE$(X) = LINE$(X - 1): REM  MOVE TEXT DOWN A LINE
41595   NEXT X
41600   LINE$(LINE%) = ""           : REM  CLEAR THE OLD LINE
41605   GOSUB 41800                 : REM  DISPLAY SCREEN
41610   RETURN
```

```
41615   REM
41620   REM  ***********************************
41625   REM
41630   REM
```

TEST POINT

There are two special boundary conditions that must be tested for at this point. These occur when inserting on either the first or the last line of the array.

Enter RUN (CR) and the cursor will appear on line 1. You can test the first boundary condition by entering ^B. The screen should clear and all the lines be redisplayed, but shifted down one line. The first line should be blank.

The testing of the second boundary condition will be done later, after the cursor can be moved to the bottom of the text.

Jump to the Last Page

Control E (^E) is used to jump to the last page. When you are editing a document, it is very convenient to be able to jump directly to the end of the document. You must test to verify that there is more than one page of text; otherwise, you simply adjust the pointers for the last page.

The following subroutine allows you to jump to the last page of text:

```
41435   REM  JUMP TO LAST PAGE
41440   REM
41445   FIRST% = MLINE% - 23       : REM  FIND THE LINE AT THE TOP OF THE SCREEN
41450   IF FIRST% < 1 THEN FIRST% = 1: REM  CANNOT HAVE LINE LESS THAN 1
41455   LINE% = FIRST%
41460   ROW% = 1
41465   COL% = 1
41470   GOSUB 41800                : REM  DISPLAY THE SCREEN
41475   RETURN
41480   REM  ***********************************
41485   REM
```

TEST POINT

Execute the program and enter ^E. The last page of the text should be displayed and the cursor should be on the top line of the screen.

Tab Stops

A control I is the traditional TAB key on a computer terminal, and the default tabs are set at eight spaces each.

Tab stops are a convenient feature to include in the text editor. Their use in program development provides increased readability. In a letter they provide the ability to easily indent text.

The TAB key will move the cursor right to the next tab stop, every eight characters (this is the default value), if there is already text on the line. However, if we are moving the cursor past the end of the text on the line, we must insert spaces into the text line as we TAB.

As an option, this feature could be added directly to the line editor. If you choose to do so, you must modify the line feed routine for the continuation character since it currently uses the TAB routine to indent the next line.

The TAB routine is as follows:

```
41320   REM  TAB
41325   REM
41330   PLACE% = ( INT (PLACE% / 8) + 1) * 8: REM  SLIDE THE CURSOR RIGHT
41332   IF PLACE% > MAXSIZE% THEN PLACE% = MAXSIZE%
41335   IF  PLACE% < = LEN (LINE$(LINE%)) THEN
          RETURN : REM  WITHIN CURRENT FIELD
41340   FOR X = LEN (LINE$(LINE%)) TO PLACE% - 1
41345   LINE$(LINE%) = LINE$(LINE%) + " ": REM  ADD SPACES TO THE END
41350   NEXT X
41355   RETURN
41360   REM  ******************************
41365   REM
```

TEST POINT

At this point you will do two tests. First, enter ^I on line 1, and the cursor should move over to the eighth column. Since the line contains text, no blanks will be inserted. Next, move the cursor to the front of the line and then delete all of the text by using the delete-to-end-of-line command. Now enter ^I, and eight spaces should be inserted and the cursor positioned on column 8.

Moving Down a Line

Two different keys can be used to move down a line: ^J (line feed) or RETURN. The line feed commmand will keep the cursor in the same column on the screen. The RETURN acts like a carriage return on a typewriter and will move the cursor to the first character of the next line.

To move down a line, we increment both LINE% and ROW% by one. However, we must also test a number of boundary conditions. LINE% cannot be larger than LAST%, since LAST% is the array dimension. If LINE% becomes larger than MLINE% (the bottom of the array), then MLINE% must be incremented. Next, we test the line we are leaving for continuation characters. If there is a continuation character *and* the next line is blank, editing will begin at the first tab stop on the next line. This feature is especially convenient for the user if a BASIC program is being written. Indenting the line will make it stand out from the rest of the text. We do not indent if the line is not blank because a nonblank line means that the user is editing existing text. Finally, we test the line we are leaving to see whether it is the bottom line. If we want to go down one more line, the screen must be moved up. The screen is moved up by calling the page scroll subroutine.

The following routine moves the text down a line:

```
41135   REM  CARRIAGE RETURN
41140   REM
41145   PLACE% = 1
41150   GOSUB 41170                : REM  LINE FEED
41155   RETURN
41160   REM  ****************************************
41165   REM
```

```
41170   REM  LINE FEED
41175   REM
41180   IF LINE% = LAST% THEN RETURN : REM  MAX NO MORE LINES LEFT
41185   LINE% = LINE% + 1
41190   IF LINE% > MLINE% THEN MLINE% = LINE%: REM  INC THE LARGEST LINE COUNTER
41195   ROW% = ROW% + 1
41200   IF ROW% > 24 THEN ROW% = 24:X = 1:LINE% = LINE% - 1: GOSUB 41755
41205   IF ( RIGHT$ (ENTRY$,1) = "&") AND ( LEN (LINE$(LINE%)) = 0) THEN
          PLACE% = 0: GOSUB 41320: REM  TAB IN ON NEXT LINE
41210   RETURN
41215   REM  ************************************
41220   REM
```

TEST POINT

After the program for moving down a line has been typed in, enter RUN (CR). Once the new screen is displayed, enter another (CR) and the cursor should move to line 2. Now edit line 2 and enter ^J. If there is no text on line 3, the cursor drops down to line 3 and moves to the first column. If there is text on the following lines, then the cursor drops down to the next line, staying in the same column. The page-scrolling test will have to be done after you have entered that routine (which is presented in a later subsection).

Moving Up a Line

The control K (^K) is used to move up one line. To move up a line, we decrement both LINE% and ROW% by one. As in moving down a line, we must also test a number of boundary conditions. LINE% must be greater than 0. If ROW% becomes equal to 0, the screen must be rolled down a line. Rolling down a line is done by telling the page scroll subroutine to move up one line.

The following routine moves the text up a line:

```
41225   REM  UP ARROW
41230   REM
41235   IF LINE% = 1 THEN RETURN : REM  AT TOP ALREADY
41240   LINE% = LINE% - 1
```

```
41245   ROW% = ROW% - 1
41250   IF ROW% < 1 THEN ROW% = 1:LINE% = LINE% + 1:X = 1: GOSUB 41695
41255   RETURN
41260   REM
41265   REM  ************************************
```

Instead of scrolling just one line up or down, you may wish to scroll half a page or 12 lines. You will have to adjust both ROW% and LINE% to do so. Some users may be annoyed that the screen refreshes every time it scrolls one line. Others may be annoyed by the cursor jumping from either the top or the bottom row to the middle of the screen. Your implementation is a matter of personal preference.

TEST POINT

Execute the program we have presented so far, and after the screen has displayed, enter a couple of carriage returns to move the cursor down the screen. Now enter ^K and move back up one line. Edit this line and enter another ^K. Next, enter a (CR) and return to the line you just edited. It should contain the text you edited. Before proceeding to the next section, check to make sure everything is working correctly. Move the cursor up and down several times and edit several lines. Also, try some of the previous commands, such as line insert and jump to the last page.

Jump to the Home Page

To jump to the original or home page, you strike control O (^O). This feature comes in handy, for example, when you are proofreading a document. Jumping to the first page is done by setting LINE%, ROW%, COL%, and FIRST% equal to 1 and then displaying the text.

The program for returning to the home page is as follows:

```
41635   REM  GOTO THE HOME PAGE
41640   REM
41645   GOSUB 41860              : REM  RESET THE POINTERS
41650   GOSUB 41800              : REM  SHOW THE SCREEN
41655   RETURN                   : REM  A OK
```

```
41660   REM
41665   REM  ****************************************
41670   REM
```

TEST POINT

To test the routine for jumping to the home page enter ^E to jump to the last page. Enter ^O to jump back to the first page, and test some of the previous commands to be sure they are still working correctly.

Concatenate Two Lines

We use control P (^P) to concatenate (combine) two lines of text into one. The routine that follows will combine the two lines and then delete the second line from the array.

If we are already on the last line, there is nothing to concatenate—this condition is the only special one. If the new line is too long, it will be truncated by the line editor.

The following program combines two lines:

```
41370   REM  PACK TWO LINES
41375   REM
41380   IF LINE% = MLINE% THEN RETURN : REM  AT THE END
41385   LINE$(LINE%) = LINE$(LINE%) + LINE$(LINE% + 1): REM  PACK THE LINES
41390   IF LINE% = MLINE% THEN GOTO 41410: REM  LAST LINE
41395   FOR X = LINE% + 1 TO MLINE% - 1
41400   LINE$(X) = LINE$(X + 1)    : REM  MOVE LINE UP ONE
41405   NEXT X
41410   LINE$(MLINE%) = ""         : REM  CLEAR THE LAST LINE
41415   MLINE% = MLINE% - 1        : REM  REDUCE MAX LINE BY ONE
41420   GOSUB 41800                : REM  DISPLAY SCREEN
41425   RETURN
41430   REM  *********************************
```

TEST POINT

To test the concatenating feature, enter ^P on the first line. The screen should clear and the new line 1 should contain the original line 1 with the

original line 2. The rest of the text lines will move up one line. If you jump to the last line, you can test the boundary condition of concatenating a blank line.

Scroll Up a Page

Control R (^R) is used to move up one page of text at a time. In the routine that follows, FIRST% and LINE% are decremented, and the text window (the space occupied by text) is moved up. For this routine we need to test for the top of the document. If the user is already on the top page of text, we will move them to the top row on the screen.

The scrolling-up routine is as follows:

```
41675   REM  SCROLL UP A PAGE
41680   REM
41685   X = 24                      : REM  JUMP A FULL PAGE
41690   REM  ENTRY POINT FOR ROLL UP
41695   IF FIRST% < = X THEN GOSUB 41860 :
          ROW% = 1: GOSUB 41800: RETURN : REM  JUMP TO TOP OF FIRST PAGE
41700   FIRST% = FIRST% - X         : REM  MOVE THE TOP LINE
41705   LINE% = LINE% - X           : REM  CHANGE THE ARRAY POINTER
41710   GOSUB 41800                 : REM  DISPLAY THE SCREEN
41715   RETURN
41720   REM
41725   REM  ******************************************
41730   REM
```

TEST POINT

Enter ^E and jump to the last page. Then use ^R to scroll up one page. Test all of the functions as you did for moving the cursor up one line. Verify that when ^K is entered on the top line of the screen, the text is scrolled down one line.

Scroll Down a Page

Control T (^T) is used to move down a page of text. Scrolling down is just the opposite of scrolling up. Scrolling down is used whenever a document is longer than 24 lines, since a display longer than 24 lines cannot be

shown on one screen page. So in large documents it becomes necessary to be able to jump up and down through the text 24 lines at a time.

The scroll-down subroutine must increment FIRST% and LINE%, then redisplay the screen. The boundary conditions occur at the bottom line and the last page. The variable X is used to set the number of lines to be scrolled. For a full page, scroll X is set equal to 24. The single-line scroll sets X equal to 1, and a half-page scroll sets X equal to 12. If the cursor is already on the last page of text, then it will move to the last line; otherwise, it will remain on the same row on the screen and the text will move one page.

The scrolling-down routine is as follows:

```
41735   REM  SCROLL DOWN A PAGE
41740   REM
41745   X = 24                      : REM  JUMP A FULL PAGE
41750   REM  ENTRY POINT FOR ROLL DOWN
41755   IF MLINE% < = 24 THEN LINE% = MLINE% :
          ROW% = MLINE%: RETURN : REM  ON FIRST PAGE
41760   IF FIRST% + X > MLINE% THEN FIRST% = MLINE% - 23 :
          LINE% = MLINE%:ROW% = 24: GOTO 41775: REM  BOTTOM
41765   FIRST% = FIRST% + X
41770   LINE% = LINE% + X
41775   GOSUB 41800                 : REM  DISPLAY THE SCREEN
41780   RETURN
41785   REM
41790   REM  ***************************************
41795   REM
```

TEST POINT

Use ^T to scroll down a page. Then perform the same tests you performed for scrolling up a page.

Deleting a Line

The control Z (^Z) command is used to delete a line of text. To delete a line, we split the array at the current line number, and all the text on the higher line numbers is moved up one line. MLINE% is decremented, and the last line is cleared.

The program for deleting a line is as follows:

```
41490   REM  DELETE A LINE
41495   REM
41500   IF MLINE% = 1 THEN LINE$(1) = "": GOTO 41535: REM  ONLY ONE LINE
41505   IF LINE% = MLINE% THEN
          ROW% = ROW% - 1:LINE% = LINE% - 1: GOTO 41525: REM  LAST LINE IN TEXT
41510   FOR X = LINE% TO MLINE% - 1
41515     LINE$(X) = LINE$(X + 1): REM  MOVE THE LINES UP
41520   NEXT X
41525   LINE$(MLINE%) = ""        : REM  CLEAR BOTTOM LINE
41530   IF MLINE% > 1 THEN MLINE% = MLINE% - 1
41535   GOSUB 41800               : REM  DISPLAY SCREEN
41540   RETURN
41545   REM
41550   REM  ************************************
41555   REM
```

TEST POINT

Special boundary conditions occur on the first and last lines of the program, so special tests are performed by the subroutine for deleting a line to detect these conditions.

Enter RUN (CR) and the cursor will appear on the first line. Enter ^Z and the screen should clear and show what appears to be lines 2 through 25 but are now really lines 1 through 24. Now enter ^E and jump to the bottom of the text. Enter ^Z and the last line should disappear.

The Escape Key

The ESC (escape) key is used to exit the text editor subroutine and return the user to the calling program (this will be the command area of part 2).

SUMMARY OF PART 1

We have now created a simple text editor. This subroutine can be used as part of a larger program. There are countless applications where such a text editor can be used.

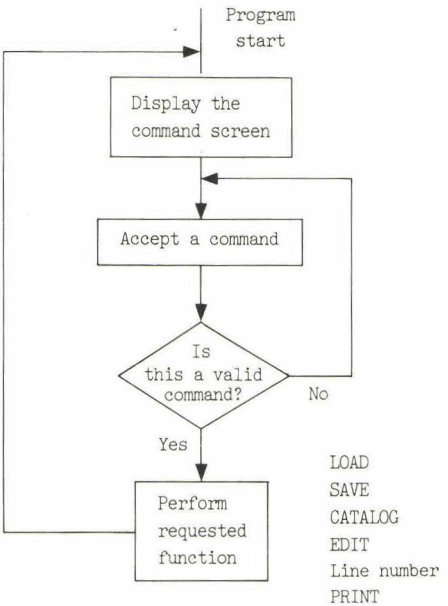
In part 2 of this chapter we will add the routine needed to make this program a full stand-alone screen text editor.

PART 2: COMPLETE TEXT EDITOR PROGRAM

The previous subroutines will edit text. It is up to the program that calls the text-editing subroutines to load or save the information edited by the user. If we add these routines to the text editor, we will have a stand-alone screen text editor. We will call this program the complete text editor.

The flowchart for the complete text editor is shown in Fig. 3.2. When a valid command is entered, the editor will execute the command and return to the command screen to await another command.

FIG. 3.2 Flowchart for the complete text editor



COMMAND DISPLAY AND PROCESSOR

The rather lengthy program listing that follows is the command display and processor routine. The display gives information on the current status of the text being edited and a HELP screen illustrating the available commands.

Before the display is shown, a FRE( ) command is executed. If there is a lot of text in the editor, this command can take several seconds to execute. The FRE( ) command is valuable for two reasons: First, it tells the user how much memory is available to accept additional text; second, it does some housekeeping of the memory for you.

FRE(0) The FRE command returns the amount of memory available to the user in bytes. FRE(0) performs the housekeeping task of clearing unused values from memory, freeing that space for current use.

The number of lines used and the auto line numbering values, if any, are shown in the command area of the program. Additionally, an explanation of the command is displayed.

The line editor is used to accept a command from the user. LEFT$ is used in the command routine to determine if a valid command has been entered. We have chosen to use full words and not abbreviations for the commands.

After a command is executed, the command screen is redisplayed and another command is accepted. Notice in the listing that follows that some of the commands return to line 40045 and some to line 40040. If the command affects the amount of free memory, then another FRE( ) command is executed; otherwise, no FRE( ) command is needed. As mentioned above, the FRE( ) command can take some time to execute if there is a lot of text, so we do not want to use it more often than necessary.

The complete text editor line numbering begins with number 40000. For this complete editor, change the value on lines 130 and 140 in the screen editor test routine from 50 to 1000. Also, delete lines 500 through 540 from the test routine.

The program listing for the command display and processor is as follows:

```
40000   REM  EDITOR * COMPLETE TEXT EDITOR WITH COMMAND AREA
40005   REM
40010   REM  USES THE LINE EDITOR WITH A FEW ADDITIONAL EXIT KEYS
40015   REM
40020   REM  COMMAND AREA ROUTINE
40025   REM
40030   MLINE% = 1              : REM  SET THE MAX LINE COUNTER
40035   GOSUB 41860             : REM  CLEAR VARIABLES
40040   FX = FRE (0)            : REM  CLEAR THE MEMORY
40045   HOME
40050   PRINT "EDITOR COMMAND AREA   FREE ";FX: REM  TITLE AND FREE MEMORY
40055   PRINT "LINES USED ";MLINE%;" ON LINE ";LINE%;
40060   IF ANUM% > 0 THEN PRINT " AUTO ";ANUM%;
40065   PRINT : PRINT
40070   PRINT ">";
40075   PRINT
40080   PRINT
40085   PRINT "LOAD NAME LOAD A TEXT FILE"
40090   PRINT "CATALOG   DISPLAY DIRECTORY"
40095   PRINT
40100   PRINT "EDIT ##   EDIT LINE NUMBER"
40105   PRINT "ESC       EDIT CURRENT LINE NUMBER"
40110   PRINT "EDIT      EDIT CURRENT LINE NUMBER"
40115   PRINT
40120   PRINT "AUTO ##   AUTO LINE NUMBER"
40125   PRINT "AUTO      TURN OFF LINE NUMBERING"
40130   PRINT
40135   PRINT "SAVE NAME SAVE THE FILE"
40140   PRINT "DONE NAME SAVE AND EXIT TO BASIC"
40145   PRINT "PACK NAME PACK, SAVE AND EXIT"
40150   PRINT
40155   PRINT "PRINT     PRINT TEXT FILE"
40160   PRINT "FORMAT    PACK AND PRINT TEXT FILE"
40165   PRINT
40170   PRINT "QUIT      EXIT TO BASIC"
40175   MASK$ = "NAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA"
40180   ENTRY$ = ""             : REM  CLEAR IT
40185   ROW% = 4                : REM  COMMAND INPUT LINE
40190   COL% = 3
40195   PLACE% = 1              : REM  EDITOR SETS PLACE%
40200   FILL$ = " "
```

```
40205  GOSUB 50120              : REM  ENTER LINE EDITOR AT HELP% = 0 LINE
40210  REM  IF E THEN CALL THE EDITOR
40215  IF KEY% = 27 THEN ENTRY$ = "EDIT": REM  ESC MEANS EDIT TEXT
40220  IF LEFT$ (ENTRY$,4) = "AUTO" THEN GOSUB 40285: REM  AUTO LINE NUMBER
40225  IF LEFT$ (ENTRY$,4) = "PACK" THEN GOSUB 40545: HOME : END : REM  PACK
40230  IF LEFT$ (ENTRY$,4) = "EDIT" THEN GOSUB 40335: GOTO 40040: REM  EDIT
40235  IF LEFT$ (ENTRY$,4) = "DONE" THEN GOTO 40510: REM  SAVE AND END
40240  IF LEFT$ (ENTRY$,4) = "LOAD" THEN GOSUB 40395: GOTO 40040: REM  LOAD
40245  IF LEFT$ (ENTRY$,7) = "CATALOG" THEN GOSUB 40745: REM  DISK CATALOG
40250  IF LEFT$ (ENTRY$,4) = "SAVE" THEN GOSUB 40595: REM  SAVE THE TEXT
40255  IF LEFT$ (ENTRY$,5) = "PRINT" THEN PR# 1:PRT% = 1: GOSUB 40595: REM  PRINT
40260  IF LEFT$ (ENTRY$,6) = "FORMAT" THEN
         PR# 1:PRT% = 1: GOSUB 40545: HOME : END : REM  PACK PRINT
40265  IF LEFT$ (ENTRY$,4) = "QUIT" THEN HOME : END : REM  CLEAR AND QUIT
40270  GOTO 40045               : REM  TRY AGAIN
40275  REM  ****************************************
40280  REM
```

The following routine is used to initialize several variables:

```
41860  REM  CLEAR EVERYTHING
41865  REM
41870  LINE% = 1                : REM  CURRENT LINE NUMBER
41875  FIRST% = 1               : REM  TOP LINE ON THE SCREEN
41880  LROW% = 1                : REM  START ON FIRST LINE
41885  LCOL% = 1
41890  ROW% = 1
41895  COL% = 1
41900  RETURN
41905  REM  ***************************
```

Various aspects of the command display routine are described in the subsections that follow.

TEST POINT

After RUN (CR) is entered, the screen should clear, the command area and the HELP screen should be displayed, and the cursor should be positioned on the fourth line next to the > symbol. The editor is waiting for a

command. The only command that can be executed at this time is QUIT. Try it to verify that at least this command works. As you can see from line 40265, QUIT clears the screen and stops execution.

The Edit Command

The EDIT command, or the ESC key, is used to toggle from the command area to the text editor. The ESC key is used to be consistent with using the ESC key to exit the text editor. The EDIT command has two modes: with or without a line number. If the user knows which line number is to be edited, then EDIT ## is used, where ## is the line to be edited. If the current text window is desired, the user does not enter a line number.

The program detects which method is used by checking the length of the command entered. If it is four characters long, then only EDIT has been entered. If it is longer than four characters, a number must be extracted from ENTRY$. This number is extracted by using a VAL( ) command. If the value (line number) does not fall within the range of line numbers available, then the user is returned to the command area and gets to try again.

VAL( ) The VAL( ) command searches the assigned string for a numerical value and returns that value. The search stops when the first nonnumerical value is encountered.

EXAMPLE

```
5000   HAZEL$ = "AGE 12"
5100   CAT$ = VAL(MID$(HAZEL$,4))
5200   PRINT CAT$
RUN
12
```

In this example we search the string HAZEL with VAL( ), starting at character position 4 (use of MID$), to avoid the search from stopping when it encounters the first nonnumerical value.

The edit routine is as follows:

```
40335   REM  EDIT THE TEXT
40340   REM
40345   IF LEN (ENTRY$) = 4 THEN GOSUB 41000: RETURN : REM  START AT CURRENT LINE
40350   FIRST% = VAL ( MID$ (ENTRY$,5)): REM  LINE NUMBER USER WANTS TO EDIT
40355   IF (FIRST% < 1) THEN FIRST% = 1
40360   LINE% = FIRST%
40365   LROW% = 1                : REM  START AT TOP LINE
40370   LCOL% = 1                : REM  START IN FIRST COLUMN
40375   GOSUB 41000              : REM  TEXT EDITOR
40380   RETURN
40385   REM  *********************************
40390   REM
```

TEST POINT

After the edit routine is entered, you will be able to move back and forth between the command area and the editor. Either enter EDIT (CR) or hit the ESC key. The screen should clear and you should be able to enter and edit text. Use the ESC key when you wish to exit the editor and return to the command area. Once in the command area, hit the ESC key again to be sure that the editor returns the correct display. You are rapidly approaching an operational text-editing system.

Text-Saving Subroutine

Another important capability in editing is saving the text that has been entered or edited. Text is saved on disk in a sequential text file. But before a sequential text file is saved to disk, any old file with the same name must be erased. If the old text file is not erased, the new text file will be written over the old text file. If the new file is not as long as the old file, part of the old file will remain at the end of the new file.

The DELETE command is used to delete or erase a file. However, a two-line command sequence is needed and not simply a DELETE command. The sequence that must be used is

```
PRINT DSK$;"OPEN SALES LETTER"
PRINT DSK$;"DELETE SALES LETTER"
```

An attempt to delete a file that does not exist will generate an error message, and the program will abort. If the file is opened before a DELETE is issued, then you have ensured that there is a file to delete. In other words, if the file was there, it was OPENed; but if the file was not there, then the OPEN command created a new file. In either case we have a file that can be deleted, and we do not have to be concerned about getting a FILE NOT FOUND error.

DELETE The DELETE command removes a file name from the disk directory, and you will no longer have access to the file. The DELETE command must be preceded by a CHR$(4) in the program.

EXAMPLE

```
5000   PRINT CHR$(4) "DELETE LETTER"
```

or

```
5000   A$ = "FRED"
5100   PRINT CHR$(4);"DELETE ";A$
```

These two examples simply show how you would delete files from within a program. The first example deletes a specific file named LETTER. The second example deletes whatever file has been assigned to A$.

OPEN The OPEN command is used in conjunction with the READ and WRITE commands to create and retrieve sequential text files. It allocates a buffer in memory for the text file, and it allows the system to read or write from the beginning of the file.

As mentioned above, if a file with the name you selected does not exist, then the OPEN command will automatically add it to the disk catalog. Once we are sure that a file is deleted, we OPEN it and begin saving the text. If this process seems complex, it is. But it is part of the Apple operating system, and we must work within it.

Text is sent to the disk by using a FOR–NEXT loop and PRINTing the text after a WRITE command has been issued, as follows:

```
PRINT DSK$;"WRITE SALES LETTER"
```

WRITE The WRITE command causes all subsequent PRINT statements to print to the disk. WRITE is in effect until an error, an INPUT statement, or a CHR$(4) occurs. A WRITE command must be preceded by a CHR$(4).

EXAMPLE

```
5000   PRINT CHR$(4);"WRITE MAY SALES"
```

or

```
5000   A$ = "JUNE WHEAT"
5100   PRINT CHR$(4);"WRITE ";A$
```

The first example shows how a specific file can be written to disk (SALES). The second example shows how any file can be assigned the value of A$.

The text-saving routine that follows allows text to be saved in two different formats. In the first format the text is saved exactly as it looks on the screen. In the second format the continuation symbols are removed and the text is saved in packed or concatenated form. For the second format the array is processed looking for & symbols as the last character of a line. When an & is found, the current line and the next line are concatenated and MLINE% is decremented. After the entire array is packed, it is written to disk by using the same save routine that is used by the first save format.

The & symbol is used as the continuation line symbol within the text editor. When you are typing a lengthy piece of text within the editor, use an & as the last character on a line. The PACK command later removes the & symbols and saves the text.

For the reading of a sequential file without error, the number of lines in the file must be known. Therefore the number of lines (MLINE%) is printed as the first line in the file.

When two lines are concatenated, all leading spaces in the second line are removed. The leading spaces are there to indent the text and make it more legible. If you want spaces at this point in the line, they must be added in front of the & symbol.

Once all the text is written to the disk, it is necessary to CLOSE the file. Closing the file must be done to ensure that the text has actually been written to the disk. That is, as a line is PRINTed, the Apple does not immediately put it on the disk. The text first goes to a temporary storage location in memory (commonly called a BUFFER). This buffer is 256 bytes (characters) long; it is the same size as one sector on the disk. Rather than write the text out at every PRINT command, the Apple waits until it has a full 256-byte sector before it writes. This feature is included for efficiency. It is done automatically as data is sent to or retrieved from the disk.

What happens if the buffer is not completely filled and nothing else is to be sent to the disk? Well, the computer will wait for you to finish filling the buffer, not realizing that you are done. If you turn off the computer, that last partial buffer will never make it to the disk. Hence we have the CLOSE command. It tells the computer that you are done using that disk file and to write the buffer to disk.

CLOSE The CLOSE command deallocates the buffer and, in the WRITE mode, forces the remaining bytes in the buffer to disk. CLOSE must follow a CHR$(4). There are two modes: with and without a file name. With a file name, only that file is closed. Without a file name *all* files are closed.

EXAMPLE

```
5000   PRINT CHR$(4);"CLOSE LETTER"
```

or

```
5000   A$ = "MAY SALES"
5100   PRINT CHR$(4);"CLOSE ";A$
```

or

```
5000   PRINT CHR$(4);"CLOSE"
```

In these three examples we see that the CLOSE command must always be preceded by a CHR$(4), the disk command, and that we do not *have* to be file-specific, although we may find it convenient to be.

The following subroutine saves text on a disk:

```
40510  REM  SAVE TEXT AND END
40515  REM
40520  GOSUB 40595                : REM  SAVE THE TEXT
40525  HOME
40530  END
40535  REM  ***********************************
40540  REM
40545  REM  CONCATENATE AND SAVE FILE
40550  REM
40555  Y = 0
40560  FOR X = 1 TO MLINE%
40565  Y = Y + 1
40570  LINE$(Y) = LINE$(X)        : REM  PACK THE ARRAY
40575  IF RIGHT$ (LINE$(X),1) = "&" THEN GOSUB 40700: GOTO 40580
40580  NEXT X
40585  MLINE% = Y                 : REM  NEW MAX LINE COUNT
40590  REM
40595  REM  SAVE THE TEXT
40600  REM
40605  DSK$ = CHR$ (4)            : REM  SET FOR DISK IO
40610  PRINT
40615  ENTRY$ = MID$ (ENTRY$,5)   : REM  GET THE FILE NAME
40620  IF PRT% > 0 THEN GOTO 40650: REM  PRINT IT DON'T WRITE TO DISK
40625  PRINT DSK$;"OPEN ";ENTRY$
40630  PRINT DSK$;"DELETE ";ENTRY$: REM  ERASE IT
40635  PRINT DSK$;"OPEN ";ENTRY$  : REM  OPEN A NEW CLEAN FILE
40640  PRINT DSK$;"WRITE ";ENTRY$
40645  PRINT MLINE%               : REM  NUMBER OF LINES
40650  FOR X = 1 TO MLINE%
40655  IF PRT% > 0 THEN
         PRINT LINE$(X): REM  SEND IT TO THE PRINTER NO QUOTES
40660  IF PRT% = 0 THEN PRINT CHR$(34);LINE$(X);CHR$(34): REM  SEND IT TO
         THE DISK
40665  NEXT X
40670  IF PRT% > 0 THEN PRT% = 0: PRINT CHR$(12):PR#0: RETURN : REM  SET
         CRT AND FORM FEED
40675  PRINT DSK$;"CLOSE ";ENTRY$
40680  PRINT
40685  RETURN
```

```
40690   REM  ************************************
40695   REM
40700   REM  CONCATENATE IT
40705   IF MID$ (LINE$(X + 1),1,1) = " " THEN
          LINE$(X + 1) = MID$ (LINE$(X + 1),2): GOTO 40705: REM  STRIP SPACES
40710   XX = LEN (LINE$(Y)) - 1
40715   LINE$(Y) = LEFT$ (LINE$(Y),XX) + LINE$(X + 1): REM  STRIP '&' AND PACK
40720   X = X + 1
40725   IF RIGHT$ (LINE$(Y),1) = "&" THEN GOTO 40700: REM  CONTINUE PACKING
40730   RETURN
40735   REM
40740   REM  ****************************************
```

TEST POINT

This test is the first part of a two-part test. (The second part occurs after the next subsection.) Edit some text, and then save it by entering SAVE TEST TEXT (CR). Next, execute the save subroutine to see if TEST TEXT was saved.

Text-Loading Subroutine

Text is saved as a sequential text file by using a PRINT statement. In contrast, an INPUT command is used to load the text into the editor.

The Apple II uses the same commands for reading and writing to the disk and the screen. For the computer to know that you really want the data to go to or come from the disk, you must use CHR$(4), control D, in front of the disk command. For convenience, instead of typing CHR$(4) every time we have a disk command in our programs, we set DSK$ equal to CHR$(4).

To load a text file, we use a READ command, such as

```
PRINT DSK$;"READ SALES LETTER"
```

While the READ command is in effect, all INPUT statements will receive their data from the disk and not the keyboard. The READ command is in effect until another CHR$(4) is encountered.

READ The READ command is used to allow the INPUT command or the GET command to retrieve data from a sequential text file one field at a time.

The following routine loads text into the editor:

```
40395   REM  LOAD A TEXT FILE
40400   REM
40405   DSK$ = CHR$ (4)          : REM  SET FOR DISK IO
40410   PRINT
40415   ENTRY$ = MID$ (ENTRY$,5)
40420   IF LEN (ENTRY$) = 0 THEN RETURN : REM  THE USER FORGOT THE NAME
40425   PRINT DSK$;"OPEN ";ENTRY$
40430   PRINT DSK$;"READ ";ENTRY$
40435   INPUT X                  : REM  NUMBER OF LINES
40440   REM
40445   FOR Y = 1 TO X
40450   Z = LINE% + Y - 1: REM  START INSERT AT THIS LINE
40455   INPUT LINE$(Z): REM  READ A LINE
40460   NEXT Y
40465   PRINT : REM  TO CLEAR EVERYTHING
40470   PRINT DSK$;"CLOSE ";ENTRY$
40475   IF MLINE% < Z THEN MLINE% = Z : REM  SET THE UPPER LIMIT
40480   RETURN
40485   REM
40490   REM
40495   REM  **********************
40500   REM
40505   REM
```

TEST POINT

The test here is to reload the file just saved in the previous test point. To be sure that all the variables are cleared, enter QUIT, RUN the program, and then enter LOAD TEST TEXT (CR). Depress the ESC key, and the screen should display the text you previously saved. If it does not, determine whether the error occurred in the load or the save routine. Check the save routine first.

Auto Line Numbering

Auto line numbering is a convenience feature for editing BASIC programs with the editor. The routine consists of two sections: the switch section, which turns the line-numbering feature on and off, and the actual line-numbering routine.

When the AUTO command is entered without a number or with the number 0, then line numbering will be turned off. Otherwise, line numbering will begin with the line number entered.

When line numbering is turned on, the editor calls the numbering routine with every key (see line 50347 in the program for inserting control characters). The numbering routine tests to see if a space was entered (ASCII value 32) as the first character. If a space was not entered or if numbering is turned off, the key will be accepted as normal and the routine will return to the caller. If a space is entered and line numbering is on, a line is created by using the current line number. Next, the line number is incremented. We prefer to increment by five, but you can select any value. It is not advisable to increment by one unless you write error-free programs.

A new MASK$ character, N, has been added to support auto numbering. The screen editor's MASK$ is defined only once (on line 40175 in the command display routine). There are a number of different ways to implement this MASK$ feature, but we believe that the method we have used is the most understandable and straightforward.

The routine for auto line numbering is as follows:

```
40285   REM  SET THE AUTO NUMBER SWITCH
40290   REM  FLIP ITS VALUE
40295   REM
40300   TXTSIZE% = LEN (ENTRY$)
40305   IF TXTSIZE% = 4 THEN ANUM% = 0: RETURN : REM  TURN OFF AUTO NUM
40310   ENTRY$ = MID$ (ENTRY$,5) : REM  GET THE VALUE
40315   ANUM% = VAL (ENTRY$)
40320   RETURN
40325   REM  ****************************************
40330   REM

41270   REM  NUMBER
41275   IF KEY% < > 32 THEN GOSUB 50900: RETURN
```

```
41280   IF ANUM% = 0 THEN GOSUB 50900: RETURN
41285   ENTRY$ = STR$ (ANUM%) + "  "
41290   ANUM% = ANUM% + 5
41295   PLACE% = LEN (ENTRY$)
41300   GOSUB 52130                : REM  PRINT ENTRY$
41305   GOSUB 52000                : REM  CURSOR DISPLAY
41310   RETURN
41315   REM  ***********************************
```

TEST POINT

In the command area, turn auto line numbering on by using the command

```
AUTO 100 (CR)
```

Hit the ESC key to move to the editor. Once in the editor, hit the space bar. The number 100 should appear and the cursor should be positioned at the first tab stop. Enter some text and a (CR). On the second line, hit the space bar again. The number 105 should appear with the cursor at the first tab stop.

To turn auto line numbering off, return to the command area and enter

```
AUTO (CR)
```

Return to the editor and verify that it has turned off.

Catalog

There is nothing more annoying than being in a program and discovering that you have forgotten the name of a file or the specific diskette that is in the disk drive. The CATALOG command saves you time and frustration because it eliminates the need to exit the program to do a CATALOG. This feature is user friendly. Since in our editor we use everything the user enters in ENTRY$ as a disk command, this feature can be used to catalog any diskette. For example, CATALOG D2 entered as ENTRY$ will print a catalog of disk 2 to the screen.

CATALOG The CATALOG command displays the directory of the files on diskette. When used in a program, it must be preceded by a CHR$(4).

EXAMPLE

```
5000   PRINT CHR$(4);"CATALOG"
```

or

```
5000   PRINT CHR$(4); "CATALOG D2"
```

These examples illustrate the use of the CATALOG command from a program. As shown, the command must be preceded by a CHR$(4), the disk command.

The INPUT command at the end of the routine that follows is provided to allow the user time to read the last group of file names.

The catalog routine is as follows:

```
40745   REM  CATALOG DISK
40750   REM
40755   HOME                        : REM  CLEAR SCREEN
40760   DSK$ = CHR$ (4)
40765   PRINT
40770   PRINT DSK$;ENTRY$           : REM  ENTRY$ CONTAINS FULL REFERENCE
40775   PRINT
40780   PRINT
40785   INPUT "ENTER RETURN TO CONTINUE";ENTRY$: REM  PAUSE AT BOTTOM
40790   RETURN
40795   REM  ***********************************
40800   REM
```

TEST POINT

Type in catalog (CR) from the command area. Drive one should activate, and the directory should appear on the screen. The catalog routine is the end of the text editor program. To be sure that nothing has been acciden-

tally changed during entry, go back and test every feature and verify that the program works properly.

If everything has tested satisfactorily so far, delete lines 100–590 and replace them with the following lines:

```
100   LAST% = 1000: REM  NUMBER OF LINES OF TEXT
110   DIM LINE$(LAST%): REM  THE TEXT ARRAY
120   REM
```

These lines are necessary for executable code in the future.

ENHANCEMENTS

The screen text editor is very useful for program development and for creating help files and letters. It should be used to enter the programs for the subsequent chapters. Enhancements can be made either by implementing more commands in the command mode or by using the remaining control characters in the text editor itself. By looking at some of the word processors on the market, you may find additional features to add. Remember, however, that as more features are added, the amount of memory available for text becomes smaller, so the size of your largest possible document shrinks.

MERGING PROGRAMS BY USING EXEC

Working your way through the rest of the book will become much easier. Now you can use the editor, which you just typed in and debugged, for the entry of all the subsequent programs.

Keep in mind that the files you type in with the editor are saved as text files. To load a program saved as a text file, use the command EXEC (file name). EXEC loads a text file and executes it as a program. During an EXEC the Apple treats each line of the text file as if it were being typed in from the keyboard. In this manner the text is converted to program format (it can be saved as an Applesoft file now).

If you used continuation symbols in your text, then you must save the file by using the PACK command to strip out the continuation symbols. When using PACK, remember to use a file name different from the one you used with SAVE; otherwise, you will erase the original unpacked text file. Next, this packed text file can be EXECed; the DOS SAVE command is used to save the file as an Applesoft file.

Two text files can be merged together by EXECing first one and then the other into memory (they are loaded sequentially) and then saving them to disk under a new name—thus giving you a new, contiguous program. These merging techniques will see a lot of use in the coming chapters and in your own programming as you write programs and add pieces of others to new programs.

As a text file is being EXECed, the Apple prints a] symbol for each line accepted. Occasionally, a SYNTAX ERROR message will be printed on the screen. This error means that the Apple has encountered an illegal command and that this line was not accepted. You will have to correct the line by comparing a listing of the original text file with the accepted program listing. Remember, the Apple treats every line of the EXECed text file as though it were typed directly from the keyboard. When you enter a bad program line from the keyboard, the Apple gives you a SYNTAX ERROR; therefore it will give the same message when a bad line is EXECed.

Be aware that EXECing a file into memory will cause it to merge with anything that is already present in memory—like your HELLO program. It is a good idea to type NEW before EXECing a file into memory.

USER INSTRUCTIONS

The user instructions presented here are included for two reasons. First, they will help you understand the text editor program and its capabilities. Second, they should be part of the documentation you prepare for any program you write that incorporates the text editor.

The following sections cover entry and editing of text, using the command area, creating new documents, and saving, loading, merging, and printing documents.

Entering and Editing Text in the Text Editor

With the text editor you are able to enter and edit text. You may move the cursor up or down from line to line or page to page. You can insert blank lines or delete lines anywhere in the text, and you can enter lines longer than the screen width.

The text editor uses all the commands of the line editor plus several additional control keys. The newly added keys and their functions are as follows:

^B	(control B)	Insert a blank line into array.
^E	(control E)	Jump to last page.
^I	(control I)	Tab over 8 spaces or add spaces to line.
^J	(control J)	Down arrow, move down one line.
^K	(control K)	Up arrow, move up one line.
^M	(control M)	RETURN, move down one line.
^O	(control O)	Jump to first page of text.
^P	(control P)	Concatenate two lines of text.
^R	(control R)	Scroll up one full page of text.
^T	(control T)	Scroll down one full page of text.
^Z	(control Z)	Delete a line and compress array.
ESC	(ESCape)	All done. Exit the text editor.

Command Area

In addition to being able to enter and edit text, the screen editor is capable of loading and saving text to the disk or sending it to the printer. The commands consist of a complete word followed, in some commands, by a disk file name or number. The command words are as follows:

LOAD FN	Load the disk file called FN.
CATALOG	Display the disk directory.
AUTO #	Turn auto line numbering on or off.

AUTO	Turn auto line numbering off.
EDIT #	Edit the text starting at line number #.
EDIT or ESC key	Return to the current page in the text editor.
SAVE FN	Save text to disk file called FN.
DONE FN	Save text and then QUIT.
PACK FN	Concatenate, save text file, and then quit.
PRINT	Print the text file.
FORMAT	Pack and print the text file.
QUIT	Return to BASIC and clear the array.

Creating a New Document

To enter a new document, you simply enter either

```
EDIT 1 or EDIT or ESC
```

while in the command mode. When the cursor reaches the bottom of the screen, the text will scroll up a line so that you may continue editing without interruption. Also, if you are on the top row of the screen and going up, the text scrolls down a line until you reach the first line of text.

When you finish editing text, enter ESC to return to the command area.

Saving a Document

There are three different ways to save text. First, you can use the SAVE FN command, where FN is the disk file name of your choice. This command will save the current text file and return you to the command area. Second, DONE FN will save the text file and return you to BASIC. Finally, PACK FN will concatenate all the continuation lines and save the concatenated file. Once completed, PACK will return you to BASIC.

Here are some examples of how to use these commands:

```
SAVE LETTER TO FRED
SAVE MAILING LIST

DONE EDITOR PROGRAM
DONE PRICES

PACK LETTER TO FRED PACKED
PACK PACKED EDITOR PROGRAM
```

All the files saved to disk are called TEXT FILES. They are identified by a T in front of them when you do a catalog.

Loading an Existing Document

An existing document is loaded by using the LOAD FN command. For example, to load and then edit an existing text file called PARTS LIST, you enter

```
LOAD PARTS LIST
```

After the file is loaded, enter either

```
EDIT or EDIT 1 or ESC
```

to begin editing the text on line 1.

If you wish to begin editing the document on some line other than line 1, enter

```
EDIT #
```

where # is the number of the line you wish to edit. For example, to begin editing on line 34, enter EDIT 34.

Merging Documents

A text file on the disk can be merged with text already in memory. This task is accomplished by placing the cursor one line lower than the last desired line of the text in memory; the line marked by the cursor and all fol-

lowing lines will be lost. Then ESC to the command mode. Load the new text from disk (you must load all of it) by using the LOAD FN command, and the text will be merged. Save this new document under a new name or you will lose the original.

Printing Documents

Any loaded document can be printed by using either the PRINT FN or the FORMAT FN command. The PRINT command will print the document exactly as seen on the screen. The FORMAT command will concatenate the continuation lines before printing.

COMPLETE SCREEN TEXT EDITOR PROGRAM

Here is the complete screen text editor listing:

```
100     LAST% = 1000              : REM  NUMBER OF LINES OF TEXT
110     DIM LINE$(LAST%)          : REM  THE TEXT ARRAY
120     REM

40000   REM  EDITOR * COMPLETE TEXT EDITOR WITH COMMAND AREA
40005   REM
40010   REM  USES THE LINE EDITOR WITH A FEW ADDITIONAL EXIT KEYS
40015   REM
40020   REM  COMMAND AREA ROUTINE
40025   REM
40030   MLINE% = 1                : REM  SET THE MAX LINE COUNTER
40035   GOSUB 41860               : REM  CLEAR VARIABLES
40040   FX = FRE (0)              : REM  CLEAR THE MEMORY
40045   HOME
40050   PRINT "EDITOR COMMAND AREA   FREE ";FX: REM  TITLE AND FREE MEMORY
40055   PRINT "LINES USED ";MLINE%;" ON LINE ";LINE%;
40060   IF ANUM% > 0 THEN PRINT " AUTO ";ANUM%;
40065   PRINT : PRINT
40070   PRINT ">";
40075   PRINT
40080   PRINT
```

```
40085   PRINT "LOAD NAME LOAD A TEXT FILE"
40090   PRINT "CATALOG   DISPLAY DIRECTORY"
40095   PRINT
40100   PRINT "EDIT ##   EDIT LINE NUMBER"
40105   PRINT "ESC       EDIT CURRENT LINE NUMBER"
40110   PRINT "EDIT      EDIT CURRENT LINE NUMBER"
40115   PRINT
40120   PRINT "AUTO ##   AUTO LINE NUMBER"
40125   PRINT "AUTO      TURN OFF LINE NUMBERING"
40130   PRINT
40135   PRINT "SAVE NAME SAVE THE FILE"
40140   PRINT "DONE NAME SAVE AND EXIT TO BASIC"
40145   PRINT "PACK NAME PACK, SAVE AND EXIT"
40150   PRINT
40155   PRINT "PRINT     PRINT TEXT FILE"
40160   PRINT "FORMAT    PACK AND PRINT TEXT FILE"
40165   PRINT
40170   PRINT "QUIT      EXIT TO BASIC"
40175   MASK$ = "NAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA"
40180   ENTRY$ = ""               : REM  CLEAR IT
40185   ROW% = 4                  : REM  COMMAND INPUT LINE
40190   COL% = 3
40195   PLACE% = 1                : REM  EDITOR SETS PLACE%
40200   FILL$ = " "
40205   GOSUB 50120               : REM  ENTER LINE EDITOR AT HELP% = 0 LINE
40210   REM  IF E THEN CALL THE EDITOR
40215   IF KEY% = 27 THEN ENTRY$ = "EDIT": REM  ESC MEANS EDIT TEXT
40220   IF LEFT$ (ENTRY$,4) = "AUTO" THEN GOSUB 40285: REM  AUTO LINE NUMBER
40225   IF LEFT$ (ENTRY$,4) = "PACK" THEN GOSUB 40545: HOME : END : REM  PACK
40230   IF LEFT$ (ENTRY$,4) = "EDIT" THEN GOSUB 40335: GOTO 40040: REM  EDIT
40235   IF LEFT$ (ENTRY$,4) = "DONE" THEN GOTO 40510: REM  SAVE AND END
40240   IF LEFT$ (ENTRY$,4) = "LOAD" THEN GOSUB 40395: GOTO 40040: REM  LOAD
40245   IF LEFT$ (ENTRY$,7) = "CATALOG" THEN GOSUB 40745: REM  DISK CATALOG
40250   IF LEFT$ (ENTRY$,4) = "SAVE" THEN GOSUB 40595: REM  SAVE THE TEXT
40255   IF LEFT$ (ENTRY$,5) = "PRINT" THEN PR# 1:PRT% = 1: GOSUB 40595: REM  PRINT
40260   IF LEFT$ (ENTRY$,6) = "FORMAT" THEN
          PR# 1:PRT% = 1: GOSUB 40545: HOME : END : REM  PACK PRINT
40265   IF LEFT$ (ENTRY$,4) = "QUIT" THEN HOME : END : REM  CLEAR AND QUIT
40270   GOTO 40045                : REM  TRY AGAIN
40275   REM  ****************************************
40280   REM
```

```
40285  REM  SET THE AUTO NUMBER SWITCH
40290  REM  FLIP ITS VALUE
40295  REM
40300  TXTSIZE% = LEN (ENTRY$)
40305  IF TXTSIZE% = 4 THEN ANUM% = 0: RETURN : REM  TURN OFF AUTO NUM
40310  ENTRY$ = MID$ (ENTRY$,5) : REM  GET THE VALUE
40315  ANUM% = VAL (ENTRY$)
40320  RETURN
40325  REM  ****************************************
40330  REM
40335  REM  EDIT THE TEXT
40340  REM
40345  IF LEN (ENTRY$) = 4 THEN GOSUB 41000: RETURN : REM  START AT CURRENT LINE
40350  FIRST% = VAL ( MID$ (ENTRY$,5)): REM  LINE NUMBER USER WANTS TO EDIT
40355  IF (FIRST% < 1) THEN FIRST% = 1
40360  LINE% = FIRST%
40365  LROW% = 1                : REM  START AT TOP LINE
40370  LCOL% = 1                : REM  START IN FIRST COLUMN
40375  GOSUB 41000              : REM  TEXT EDITOR
40380  RETURN
40385  REM  ************************************
40390  REM
40395  REM  LOAD A TEXT FILE
40400  REM
40405  DSK$ = CHR$ (4)          : REM  SET FOR DISK IO
40410  PRINT
40415  ENTRY$ = MID$ (ENTRY$,5)
40420  IF LEN (ENTRY$) = 0 THEN RETURN : REM  THE USER FORGOT THE NAME
40425  PRINT DSK$;"OPEN ";ENTRY$
40430  PRINT DSK$;"READ ";ENTRY$
40435  INPUT X                  : REM  NUMBER OF LINES
40440  REM
40445  FOR Y = 1 TO X
40450  Z = LINE% + Y - 1: REM  START INSERT AT THIS LINE
40455  INPUT LINE$(Z): REM  READ A LINE
40460  NEXT Y
40465  PRINT : REM  TO CLEAR EVERYTHING
40470  PRINT DSK$;"CLOSE ";ENTRY$
40475  IF MLINE% < Z THEN MLINE% = Z: REM  SET THE UPPER LIMIT
40480  RETURN
40485  REM
```

```
40490   REM
40495   REM  ********************
40500   REM
40505   REM
40510   REM  SAVE TEXT AND END
40515   REM
40520   GOSUB 40595               : REM  SAVE THE TEXT
40525   HOME
40530   END
40535   REM  ***********************************
40540   REM
40545   REM  CONCATENATE AND SAVE FILE
40550   REM
40555   Y = 0
40560   FOR X = 1 TO MLINE%
40565   Y = Y + 1
40570   LINE$(Y) = LINE$(X)       : REM  PACK THE ARRAY
40575   IF RIGHT$ (LINE$(X),1) = "&" THEN GOSUB 40700: GOTO 40580
40580   NEXT X
40585   MLINE% = Y                : REM  NEW MAX LINE COUNT
40590   REM
40595   REM  SAVE THE TEXT
40600   REM
40605   DSK$ = CHR$ (4)           : REM  SET FOR DISK IO
40610   PRINT
40615   ENTRY$ = MID$ (ENTRY$,5) : REM  GET THE FILE NAME
40620   IF PRT% > 0 THEN GOTO 40650: REM  PRINT IT DON'T WRITE TO DISK
40625   PRINT DSK$;"OPEN ";ENTRY$
40630   PRINT DSK$;"DELETE ";ENTRY$: REM  ERASE IT
40635   PRINT DSK$;"OPEN ";ENTRY$ : REM  OPEN A NEW CLEAN FILE
40640   PRINT DSK$;"WRITE ";ENTRY$
40645   PRINT MLINE%              : REM  NUMBER OF LINES
40650   FOR X = 1 TO MLINE%
40655   IF PRT% > 0 THEN
          PRINT LINE$(X): REM  SEND IT TO THE PRINTER NO QUOTES
40660   IF PRT% = 0 THEN PRINT CHR$(34);LINE$(X);CHR$(34): REM  SEND IT TO
          THE DISK
40665   NEXT X
40670   IF PRT% > 0 THEN PRT% = 0: PRINT CHR$(12): PR#0: RETURN : REM  SET
          CRT AND FORM FEED
40675   PRINT DSK$; "CLOSE ";ENTRY$
```

```
40680  PRINT
40685  RETURN
40690  REM  ************************************
40695  REM
40700  REM  CONCATENATE IT
40705  IF MID$ (LINE$(X + 1),1,1) = " " THEN
         LINE$(X + 1) = MID$ (LINE$(X + 1),2): GOTO 40705: REM  STRIP SPACES
40710  XX = LEN (LINE$(Y)) - 1
40715  LINE$(Y) = LEFT$ (LINE$(Y),XX) + LINE$(X + 1): REM  STRIP "&" AND PACK
40720  X = X + 1
40725  IF RIGHT$ (LINE$(Y),1) = "&" THEN GOTO 40700: REM  CONTINUE PACKING
40730  RETURN
40735  REM
40740  REM  ****************************************
40745  REM  CATALOG DISK
40750  REM
40755  HOME                      : REM  CLEAR SCREEN
40760  DSK$ = CHR$ (4)
40765  PRINT
40770  PRINT DSK$;ENTRY$         : REM  ENTRY$ CONTAINS FULL REFERENCE
40775  PRINT
40780  PRINT
40785  INPUT "ENTER RETURN TO CONTINUE";ENTRY$: REM  PAUSE AT BOTTOM
40790  RETURN
40795  REM  ************************************
40800  REM
41000  REM  TEXT EDITOR
41005  REM
41010  REM  VARIABLE DEFINITION
41015  REM  LROW%   STARTING ROW NUMBER
41020  REM  LCOL%   STARTING COL NUMBER
41025  REM  LINE$() TEXT ARRAY
41030  REM  LAST%   DIMENSIONS OF TEXT ARRAY
41035  REM  MLINE%  LARGEST LINE USED IN ARRAY
41040  REM  LINE%   CURRENT LINE BEING EDITED
41045  REM  FIRST%  LINE AT TOP OF SCREEN
41050  FILL$ = " "               : REM  DEFINE THE FILL CHARACTER
41055  GOSUB 41800               : REM  DISPLAY THE SCREEN
41060  ROW% = LROW%              : REM  START AT LAST ROW
41065  COL% = LCOL%              : REM  START AT LAST COL
41070  REM
```

```
41075  REM  TOP OF EDIT LOOP
41080  CTRL% = 0; REM  CLEAR THE EXIT FLAG
41085  ENTRY$ = LINE$(LINE%)      : REM  PUT CURRENT LINE INTO LINE EDITOR
41090  IF PLACE% > LEN (ENTRY$) THEN PLACE% = LEN (ENTRY$) + 1: REM
         ASSIGN PLACE% HERE
41095  IF PLACE% = 0 THEN  PLACE% = 1: REM  NULL LINE
41100  GOSUB 50165: REM  EDIT THE TEXT BUT DO NOT REDISPLAY ENTRY$
41105  LINE$(LINE%) = ENTRY$      : REM  SAVE THE EDITED LINE
41110  IF KEY% = 27 THEN LROW% = ROW%:LCOL% = COL%: RETURN : REM  BACK TO CALLER
41115  ON CTRL% GOSUB 41130,41165,41215,41635,41675,
         41735,41490,41560,41435,41320,41370 : REM  PROCESS KEY
41120  GOTO 41075
41125  REM  ************************************
41130  REM
41135  REM  CARRIAGE RETURN
41140  REM
41145  PLACE% = 1
41150  GOSUB 41170                : REM  LINE FEED
41155  RETURN
41160  REM  ****************************************
41165  REM
41170  REM  LINE FEED
41175  REM
41180  IF LINE% = LAST% THEN RETURN : REM  MAX NO MORE LINES LEFT
41185  LINE% = LINE% + 1
41190  IF LINE% > MLINE% THEN MLINE% = LINE%: REM  INC THE LARGEST LINE COUNTER
41195  ROW% = ROW% + 1
41200  IF ROW% > 24 THEN ROW% = 24:X = 1:LINE% = LINE% - 1: GOSUB 41755
41205  IF ( RIGHT$ (ENTRY$,1) = "&") AND ( LEN (LINE$(LINE%)) = 0) THEN
         PLACE% = 0: GOSUB 41320: REM  TAB IN ON NEXT LINE
41210  RETURN
41215  REM  ***********************************
41220  REM
41225  REM  UP ARROW
41230  REM
41235  IF LINE% = 1 THEN RETURN : REM  AT TOP ALREADY
41240  LINE% = LINE% - 1
41245  ROW% = ROW% - 1
41250  IF ROW% < 1 THEN ROW% = 1:LINE% = LINE% + 1:X = 1: GOSUB 41695
41255  RETURN
41260  REM
```

```
41265  REM  ************************************
41270  REM  NUMBER
41275  IF KEY% < > 32 THEN GOSUB 50900: RETURN
41280  IF ANUM% = 0 THEN GOSUB 50900: RETURN
41285  ENTRY$ = STR$ (ANUM%) + "  "
41290  ANUM% = ANUM% + 5
41295  PLACE% = LEN (ENTRY$)
41300  GOSUB 52130              : REM  PRINT ENTRY$
41305  GOSUB 52000              : REM  CURSOR DISPLAY
41310  RETURN
41315  REM  ***********************************
41320  REM  TAB
41325  REM
41330  PLACE% = ( INT (PLACE% / 8) + 1) * 8: REM  SLIDE THE CURSOR RIGHT
41332  IF PLACE% > MAXSIZE% THEN PLACE% = MAXSIZE%
41335  IF PLACE% < = LEN (LINE$(LINE%)) THEN
         RETURN : REM   WITHIN CURRENT FIELD
41340  FOR X = LEN (LINE$(LINE%)) TO PLACE% - 1
41345  LINE$(LINE%) = LINE$(LINE%) + " ": REM  ADD SPACES TO THE END
41350  NEXT X
41355  RETURN
41360  REM  ********************************
41365  REM
41370  REM  PACK TWO LINES
41375  REM
41380  IF LINE% = MLINE% THEN RETURN : REM  AT THE END
41385  LINE$(LINE%) = LINE$(LINE%) + LINE$(LINE% + 1): REM  PACK THE LINES
41390  IF LINE% = MLINE% THEN GOTO 41410: REM  LAST LINE
41395  FOR X = LINE% + 1 TO MLINE% - 1
41400  LINE$(X) = LINE$(X + 1)   : REM  MOVE LINE UP ONE
41405  NEXT X
41410  LINE$(MLINE%) = ""        : REM  CLEAR THE LAST LINE
41415  MLINE% = MLINE% - 1       : REM  REDUCE MAX LINE BY ONE
41420  GOSUB 41800               : REM  DISPLAY SCREEN
41425  RETURN
41430  REM  *********************************
41435  REM  JUMP TO LAST PAGE
41440  REM
41445  FIRST% = MLINE% - 23      : REM  FIND THE LINE AT THE TOP OF THE SCREEN
41450  IF FIRST% < 1 THEN FIRST% = 1: REM  CANNOT HAVE LINE LESS THAN 1
41455  LINE% = FIRST%
```

```
41460   ROW% = 1
41465   COL% = 1
41470   GOSUB 41800              : REM  DISPLAY THE SCREEN
41475   RETURN
41480   REM  ************************************
41485   REM
41490   REM  DELETE A LINE
41495   REM
41500   IF MLINE% = 1 THEN LINE$(1) = "": GOTO 41535: REM  ONLY ONE LINE
41505   IF LINE% = MLINE% THEN
          ROW% = ROW% - 1:LINE% = LINE% - 1: GOTO 41525: REM  LAST LINE IN TEXT
41510   FOR X = LINE% TO MLINE% - 1
41515   LINE$(X) = LINE$(X + 1): REM  MOVE THE LINES UP
41520   NEXT X
41525   LINE$(MLINE%) = ""       : REM  CLEAR BOTTOM LINE
41530   IF MLINE% > 1 THEN MLINE% = MLINE% - 1
41535   GOSUB 41800              : REM  DISPLAY DSCREEN
41540   RETURN
41545   REM
41550   REM  ************************************
41555   REM
41560   REM  INSERT A BLANK LINE
41565   REM
41570   IF MLINE% < LAST% THEN MLINE% = MLINE% + 1
41575   Y = LINE%                : REM  LINE COUNTER
41580   IF LINE% = 1 THEN Y = 2  : REM  AT TOP OF TEXT
41585   FOR X = MLINE% TO Y STEP - 1
41590   LINE$(X) = LINE$(X - 1) : REM  MOVE TEXT DOWN A LINE
41595   NEXT X
41600   LINE$(LINE%) = ""        : REM  CLEAR THE OLD LINE
41605   GOSUB 41800              : REM  DISPLAY SCREEN
41610   RETURN
41615   REM
41620   REM  ************************************
41625   REM
41630   REM
41635   REM  GOTO THE HOME PAGE
41640   REM
41645   GOSUB 41860              : REM  RESET THE POINTERS
41650   GOSUB 41800              : REM  SHOW THE SCREEN
41655   RETURN                   : REM  A OK
```

```
41660   REM
41665   REM  ***************************************
41670   REM
41675   REM  SCROLL UP A PAGE
41680   REM
41685   X = 24                    : REM  JUMP A FULL PAGE
41690   REM  ENTRY POINT FOR ROLL UP
41695   IF FIRST% < = X THEN GOSUB 41860 :
          ROW% = 1: GOSUB 41800: RETURN : REM  JUMP TO TOP OF FIRST PAGE
41700   FIRST% = FIRST% - X       : REM  MOVE THE TOP LINE
41705   LINE% = LINE% - X         : REM  CHANGE THE ARRAY POINTER
41710   GOSUB 41800               : REM  DISPLAY THE SCREEN
41715   RETURN
41720   REM
41725   REM  *****************************************
41730   REM
41735   REM  SCROLL DOWN A PAGE
41740   REM
41745   X = 24                    : REM  JUMP A FULL PAGE
41750   REM  ENTRY POINT FOR ROLL DOWN
41755   IF MLINE% < = 24 THEN LINE% = MLINE% :
          ROW% = MLINE%: RETURN : REM  ON FIRST PAGE
41760   IF FIRST% + X > MLINE% THEN FIRST% = MLINE% - 23 :
          LINE% = MLINE%:ROW% = 24: GOTO 41775: REM  BOTTOM
41765   FIRST% = FIRST% + X
41770   LINE% = LINE% + X
41775   GOSUB 41800               : REM  DISPLAY THE SCREEN
41780   RETURN
41785   REM
41790   REM  ***********************************
41795   REM
41800   REM  DISPLAY THE CURRENT SCREEN
41805   REM
41810   HOME                      : REM  CLEAR THE SCREEN
41815   FOR X = 1 TO 24
41820       Z = FIRST% + X - 1
41825       POKE 36, 1            : REM  POSITION THE CURSOR - HTAB
41830       VTAB X
41835       PRINT LINE$(Z);
41840   NEXT X
41845   RETURN
```

```
41850   REM  ***********************************
41855   REM
41860   REM  CLEAR EVERYTHING
41865   REM
41870   LINE% = 1                  : REM  CURRENT LINE NUMBER
41875   FIRST% = 1                 : REM  TOP LINE ON THE SCREEN
41880   LROW% = 1                  : REM  START ON FIRST LINE
41885   LCOL% = 1
41890   ROW% = 1
41895   COL% = 1
41900   RETURN
41905   REM  ***************************************
50347   IF MID$ (MASK$,PLACE%,1) = "N" THEN
          GOSUB 41270: RETURN : REM  50347 AUTO NUMBER
51102   IF KEY% = 2 THEN CTRL% = 8  : REM  51102 ^B
51112   IF KEY% = 5 THEN CTRL% = 9  : REM  51112 ^E
51122   IF KEY% = 9 THEN CTRL% = 10 : REM  51122 ^I TAB
51124   IF KEY% = 10 THEN CTRL% = 2 : REM  51124 ^J
51126   IF KEY% = 11 THEN CTRL% = 3 : REM  51126 ^K
51132   IF KEY% = 15 THEN CTRL% = 4 : REM  51132 ^O
51134   IF KEY% = 16 THEN CTRL% = 11: REM  51134 ^P
51142   IF KEY% = 18 THEN CTRL% = 5 : REM  51142 ^R
51157   IF KEY% = 20 THEN CTRL% = 6 : REM  51157 ^T
51182   IF KEY% = 26 THEN CTRL% = 7 : REM  51182 ^Z
```

CHAPTER 4

ANSWERING USER HELP REQUESTS

INTRODUCTION

An on-line help system is one of the most user-friendly features a program can have. A good help system will save everyone involved with the computer both time and frustration. If the operators are not familiar with computers, they often feel afraid of making mistakes or of appearing stupid when they are confused about what the computer wants them to do. With an on-line help system they can ask the computer for assistance as often as needed. They do not have to bother you, and you will not have to answer the same question a dozen times. Once again, user-friendly software is programmer friendly.

In this chapter we develop a subroutine to display user-help screens. These screens are kept on disk and can be called automatically by the help routine whenever the user has questions. This subroutine uses the line editor subroutine from Chapter 2 as one of its building blocks.

A help system is easy to implement with the use of our line editor. We add new features to the line editor that set a variable called HELP% whenever the user requests help by entering control Q (^Q). In addition to the help subroutine, the help system consists of a series of sequential text files. A separate text file is used for each help request to be supported.

In your program you must test HELP% after every call to the line editor. If the user has requested help, then the help subroutine is called. It will clear the screen and display the appropriate help file and pause at the bottom of the screen with a request for a carriage return. After users have read the help message, they enter RETURN, and the program redisplays the original screen and continues processing.

The help text files can be entered by using the text editor developed in Chapter 3. For a help screen to be useful, it should give a manual page reference (you are going to document your program, aren't you?) and as much information as possible on what the program wants the user to do at that point. Be sure to incorporate these features in your program.

In the following sections we develop the user help program. First, we describe the design and features of the program. Then we create and test each of its component subroutines.

Note that Chapter 4 is a stand-alone chapter, i.e., it does not merge with any other chapter.

Programmer Features

For the help program presented in this chapter, the programmer only needs to pass a file name to the help subroutine and restore the original screen after the help subroutine is finished. The help file contains information about what to display in normal or inverse text and when to pause.

Design and User Features

We want the help subroutine to display a text file with highlights and pause periodically to allow the user to read the screen. Thus our help system supports INVERSE video and pauses every 22 lines (a full screen) or whenever directed by the text file.

The user should be able to terminate the help display and return to the program and should be able to control the pace at which the screen is read. These features are included in our help program.

Building the Program

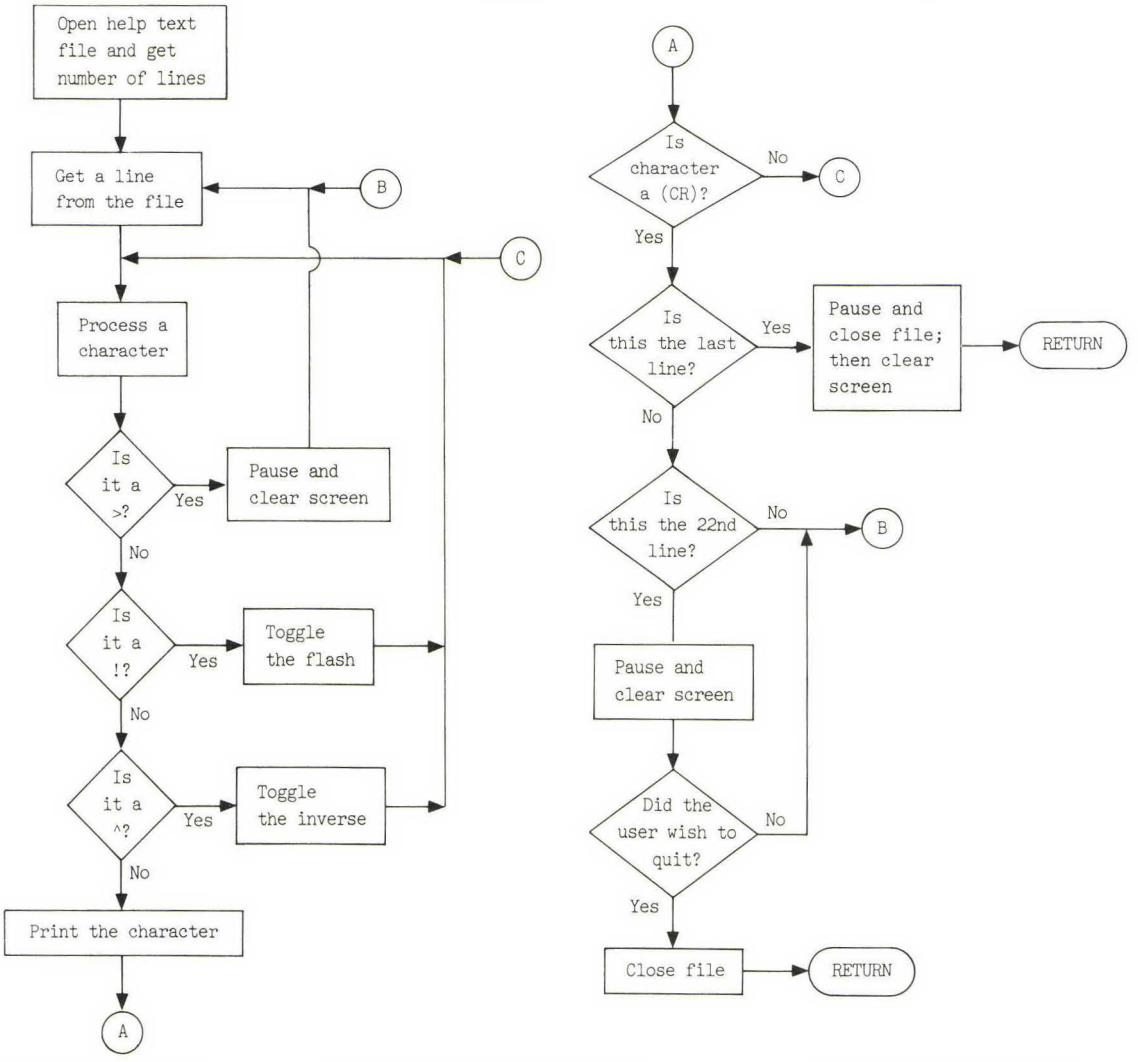
To build the help program, start with a copy of the line editor program from Chapter 2 and add the program lines from this chapter. The easiest way to accomplish this task is to proceed as follows:

1. Start with a fresh, initialized disk for the program in this chapter.
2. Transfer a copy of the line editor from Chapter 2 to the new disk (it should be an A, or Applesoft, file), using DOS.
3. Using the screen editor from Chapter 3, type in the program lines presented in this chapter and save them (these lines will be T, or text, files), call them HELP.T.
4. Using DOS, load the copy of the line editor from Chapter 2 into memory, and EXEC the file from this chapter (HELP.T), or as much as you have entered so far, into memory. Now the two files are merged and can be saved again on the disk as Applesoft files, ready to run the next time you load them.
5. Repeat steps 3 and 4 each time you enter more of the program from this chapter.

HELP PROGRAM

Figure 4.1 shows the flowchart for the help program. The processing of the screen is straightforward. After the text file is opened and the total number of lines contained in the file (LAST%) is determined, then each line is read and processed, one character at a time. The subroutine is looking for the characters used to toggle inverse video or the pause symbol. If one of these characters is found, then a GOSUB is made to the appropriate supporting subroutine. If a regular text character is found,

FIG. 4.1 Help screen flowchart



then it is printed. Finally, after all the characters on a line have been processed, a carriage return is printed and a line counter is incremented.

After 22 lines have been shown, the subroutine pauses and the user is asked,

```
DO YOU WISH MORE?
```

This message gives the user time to read the screen and an opportunity to stop the help display process if the question has already been answered. This procedure is repeated until all the lines contained in the help file have been shown or the user requests an exit.

The following program corresponds to the flowchart in Fig. 4.1:

```
21000   REM  SHOW  HELP * SCREEN DISPLAY ROUTINE
21005   REM
21010   REM
21015   REM
21020   REM  DISPLAYS SCREEN AND USES INVERSE
21025   REM  WILL PAUSE WHEN THE SCREEN IS FULL
21030   REM  PROVIDES USER TIME TO READ
21035   REM
21040   REM
21045   REM  IMPORTANT VARIABLES USED:
21050   REM       LINE%     NUMBER OF LINES TO DISPLAY
21060   REM       Y         INVERSE FLAG
21065   REM       ROW%      TOTAL NUMBER OF LINES DISPLAYED
21070   REM       XX        NUMBER OF LINES IN CURRENT SCREEN
21075   REM       NOPAUSE%  1 = DO NOT PAUSE AT END OF PAGE. 0 = PAUSE
21080   REM       HELP$     NAME OF HELP TEXT FILE
21085   REM
21090   REM  LOAD AND DISPLAY THE SCREEN
21095   REM
21100   REM  SCREEN READ ONE CHARACTER AT A TIME
21110   REM  INVERSE TOGGLED ON '^' CHARACTER
21115   REM
21120   REM
21125   REM
21130   REM
21135   ROW% = 0                    : REM  CLEAR COUNTER
21140   XX = 0
21145   DSK$ = CHR$ (4)             : REM  DISK ^D
21150   PRINT                       : REM  CLEAR ANY DSK COMMANDS
21155   PRINT DSK$;"OPEN ";HELP$
21160   PRINT DSK$;"READ ";HELP$
21165   REM
21170   REM  READ THE NUMBER OF LINES ON THE SCREEN
21175   REM
21180   INPUT LINE%
21185   REM
```

```
21190   REM  CLEAR THE COUNTERS
21195   REM
21200   ROW% = 0
21205   REM
21215   Y = 0                       : REM  INVERSE FLAG
21220   REM
21225   REM  INPUT THE SCREEN
21230   REM
21235   HOME                        : REM  CLEAR SCREEN
21240   INPUT A$                    : REM  GET A TEXT LINE
21245   FOR Z = 1 TO LEN (A$)
21250   ENTRY$ = MID$ (A$,Z,1)
21255   IF ENTRY$ = "@" THEN GOSUB 21430: REM  PAUSE WANTED
21265   IF ENTRY$ = "^" THEN GOSUB 21380: REM  TOGGLE INVERSE VIDEO
21270   PRINT ENTRY$;
21275   NEXT Z
21280   PRINT
21285   ROW% = ROW% + 1             : REM  INCREMENT LINE COUNTER
21290   XX = XX + 1                 : REM  INCREMENT THIS PAGE LINE COUNTER
21295   IF (ROW% = LINE%) OR (XX = 22) THEN GOSUB 21430: REM  DO I PAUSE?
21300   IF ROW% > = LINE% THEN PRINT DSK$;"CLOSE ";HELP$: RETURN :
          REM  RETURN TO THE CALLER
21305   REM
21310   GOTO 21240                  : REM  GET NEXT CHR
21315   REM
21320   REM  ****************************
21325   REM
```

The following subsections explain various aspects of the help routine.

Explanation of Variables

Most of the variables used in the help program are the garbage variables Y, XX, and YY. Check to be sure that the calling routine is not also using these variables if you are adding HELP to one of your programs.

There are two variables that must be set by the calling routine: HELP$ and NOPAUSE%. HELP$ is to contain the name of the text file to

be shown. NOPAUSE% is tested to determine whether the pause line is to be printed. It is normally set to 0 so that the pause is performed, but occasionally a pause may not be wanted. For example, this feature is used in Chapter 5.

Explanation of Main Help Routine

The help routine is fairly simple, but we would like to discuss a few specific lines and explain why they were used.

Line 21250 sets

```
ENTRY$ = MID$(A$,Z,1)
```

This statement sets one character from the input line and puts it in ENTRY$.

On lines 21255 and 21265 ENTRY$ is compared with the special help characters. We could have written these tests as

```
IF MID$(A$,Z,1) = "@" THEN GOSUB 21430
```

and so on. However, MID$ is a slow command, and the routine runs much faster if MID$ is used only once.

Two separate counters are maintained in the routine: one for the total number of lines to be displayed and the other for the number of lines shown on this screen. When the screen counter reaches 22, or when the end of the text file is reached, then the pause subroutine is called. After all the lines have been shown, the screen is cleared and the subroutine returns to the calling program.

TEST POINT

Before you can start testing the help routine, you need to enter a sample help screen. We suggest that you use the editor to enter the CHAP8 MENU HELP text on pages 193–194.

The following program will test the help routine. It will not pause or set inverse, but it will display the text and then end.

```
100     REM
110     REM  HELP TEST ROUTINE
120     REM
130     HELP$ = "CHAP8 MENU HELP"
140     GOSUB 21000 : REM  DISPLAY HELP
150     END
21430   RETURN : REM  PAUSE
21480   RETURN : REM  INVERSE TOGGLE
```

PAUSE SUBROUTINE

The pause subroutine is called when an @ symbol is encountered in the help text and at the end of the text file.

When the help text is created, the writer can make the routine pause by placing @ symbols in the body of the text. Pauses improve the readability of the help text by separating topics in the text. For example, the help text may first give a brief explanation of what the user is to do, then give several screens of detailed explanation. If the brief explanation only uses ten lines, it would look awkward and confusing to mix it with the beginning of the detailed explanation that follows. So a pause is used to separate the sections. The pause subroutine also gives the user the chance to exit the help system and return to the original screen.

The pause routine looks like this:

```
21430   REM  PAUSE AND ASK FOR MORE?
21435   REM
21440   REM
21445   IF NOPAUSE% > 0 THEN RETURN : REM  PROGRAMMER DOES NOT WANT PAUSE
21450   PRINT                       : REM  CLEAR GET COMMAND
21455   PRINT DSK$: REM  TURN READ OFF
21460   VTAB 23: REM  PAUSE LINE
21465   ENTRY$ = " ": REM  MAKE SURE NOTHING HERE
21470   INPUT "DO YOU WISH MORE? ";ENTRY$
21475   HOME : REM  CLEAR THE SCREEN
21480   IF ENTRY$ = "N" THEN ROW% = LINE%: RETURN : REM  THEY WANT OUT
21485   PRINT DSK$;"READ ";HELP$: REM  TURN DISK INPUT BACK ON
```

```
21490   XX = 0: REM  RESET PAGE LINE COUNTER
21495   ENTRY$ = " ": REM  REMOVE Y
21500   RETURN : REM  GET NEXT LINE
21505   REM
21510   REM  ******************************
21515   REM
```

If NOPAUSE% is greater than 1, then this whole routine is ignored and a pause is not allowed. If the user responds N to the question

```
DO YOU WISH MORE?
```

then the program sets the line counter YY to LINE%. This statement tells the line-processing routine that the complete file has been read, and it will CLOSE the help text file and return to the calling routine.

TEST POINT

The pause routine can be tested by using the previous test routine, but first delete line 21430 from the pause routine. Execute the program and it should pause at the end of the help screen.

TURNING INVERSE ON AND OFF

The Apple BASIC command INVERSE can be used to highlight important sections of the help text. This feature enhances the overall quality and appearance of the help screens.

The ^ symbol is used to mark the beginning and the end of the text to be shown in INVERSE. Whenever this symbol is encountered, the current state of INVERSE is reversed. In other words, if the display is in the NORMAL condition and a ^ is encountered, then the INVERSE command is issued and a flag is set to remind the user that INVERSE is on. When the next ^ is encountered, a NORMAL command is issued and the flag is reset to 0. This technique allows an individual letter or word or the entire text to be highlighted.

EXAMPLE:

```
THIS IS A ^TEST^
```

This statement results in the word TEST being shown in inverse video.

The program listing for turning INVERSE on and off is as follows:

```
21375   REM
21380   REM  TOGGLE INVERSE ON/OFF
21385   REM
21390   ENTRY$ = ""
21395   IF Y > 0 THEN Y = 0: NORMAL : RETURN : REM  CLEAR INVERSE
21400   INVERSE                    : REM  TURN INVERSE ON
21405   Y = 1                      : REM  SET FLAG
21410   RETURN
21415   REM
21420   REM  ****************************
21425   REM
```

TEST POINT

The inverse routine can also be tested by using the previous test routine, but first delete line 21375 from the inverse routine. Once executed, the program should show highlighted areas and pause at the bottom of the screen.

HELP TEST ROUTINE

This help test routine can be used to test any help file. It asks for the name of the help file and displays it. A sample help file is provided on the disk called CHAP8 MENU HELP.

The test routine is as follows:

```
100   REM  TEST ROUTINE FOR HELP DISPLAY
110   REM
```

```
120   HOME
130   PRINT "SAMPLE IS CALLED: CHAP8 MENU HELP"
140   PRINT
150   INPUT "ENTER HELP SCREEN NAME ";HELP$
160   GOSUB 21000              : REM  DISPLAY SCREEN
170   GOTO 100
180   REM
190   REM  *********************************
200   REM
```

Note that the test routine presented above is a general-use testing routine. It is not for use in this chapter if the previously presented testing routine is used. They will not work together.

USER INSTRUCTIONS

The following list contains the user instructions for the help system just created. Please add these instructions to your user's manual.

- If you have any questions about what information is to be entered or how to respond to a particular request from the computer, you can request help by striking a control Q (^Q). If the computer can help you in this section, it will clear the screen and display a help message.
- Periodically, and at the end of the message, the computer will pause and ask,

  ```
  DO YOU WISH MORE?
  ```

  If you enter either a Y and a RETURN or simply a RETURN, then more text will be displayed if it is available. If you enter an N, or if the end of the help text has been reached, then the computer will redisplay the original screen, and you may continue processing.
- If the help message does not answer your questions, refer to the manual or contact the system operator.

COMPLETE HELP PROGRAM

Here is the complete listing of the help program:

```
100     REM  TEST ROUTINE FOR HELP DISPLAY
110     REM
120     HOME
130     PRINT "SAMPLE IS CALLED: CHAP8 MENU HELP"
140     PRINT
150     INPUT "ENTER HELP SCREEN NAME ";HELP$
160     GOSUB 21000              : REM  DISPLAY SCREEN
170     GOTO 100
180     REM
190     REM  *********************************
200     REM

21000   REM  SHOW HELP * SCREEN DISPLAY ROUTINE
21005   REM
21010   REM
21015   REM
21020   REM  DISPLAYS SCREEN AND USES INVERSE
21025   REM  WILL PAUSE WHEN THE SCREEN IS FULL
21030   REM  PROVIDES USER TIME TO READ
21035   REM
21040   REM
21045   REM  IMPORTANT VARIABLES USED:
21050   REM       LINE%    NUMBER OF LINES TO DISPLAY
21060   REM       Y        INVERSE FLAG
21065   REM       ROW%     TOTAL NUMBER OF LINES DISPLAYED
21070   REM       XX       NUMBER OF LINES IN CURRENT SCREEN
21075   REM       NOPAUSE% 1 = DO NOT PAUSE AT END OF PAGE. 0 = PAUSE
21080   REM       HELP$    NAME OF HELP TEXT FILE
21085   REM
21090   REM  LOAD AND DISPLAY THE SCREEN
21095   REM
21100   REM  SCREEN READ ONE CHARACTER AT A TIME
21110   REM  INVERSE TOGGLED ON '^' CHARACTER
21115   REM
21120   REM
21125   REM
```

```
21130   REM
21135   ROW% = 0                    : REM  CLEAR COUNTER
21140   XX = 0
21145   DSK$ = CHR$ (4)             : REM  DISK ^D
21150   PRINT                       : REM  CLEAR ANY DSK COMMANDS
21155   PRINT DSK$;"OPEN ";HELP$
21160   PRINT DSK$;"READ ";HELP$
21165   REM
21170   REM  READ THE NUMBER OF LINES ON THE SCREEN
21175   REM
21180   INPUT LINE%
21185   REM
21190   REM  CLEAR THE COUNTERS
21195   REM
21200   ROW% = 0
21205   REM
21215   Y = 0                       : REM  INVERSE FLAG
21220   REM
21225   REM  INPUT THE SCREEN
21230   REM
21235   HOME                        : REM  CLEAR SCREEN
21240   INPUT A$                    : REM  GET A TEXT LINE
21245   FOR Z = 1 TO LEN (A$)
21250   ENTRY$ = MID$ (A$,Z,1)
21255   IF ENTRY$ = "@" THEN GOSUB 21430: REM  PAUSE WANTED
21265   IF ENTRY$ = "^" THEN GOSUB 21380: REM  TOGGLE INVERSE VIDEO
21270   PRINT ENTRY$;
21275   NEXT Z
21280   PRINT
21285   ROW% = ROW% + 1             : REM  INCREMENT LINE COUNTER
21290   XX = XX + 1                 : REM  INCREMENT THIS PAGE LINE COUNTER
21295   IF (ROW% = LINE%) OR (XX = 22) THEN GOSUB 21430: REM  DO I PAUSE?
21300   IF ROW% > = LINE% THEN PRINT DSK$;"CLOSE ";HELP$: RETURN :
          REM  RETURN TO THE CALLER
21305   REM
21310   GOTO 21240                  : REM  GET NEXT CHR
21315   REM
21320   REM  ****************************
21325   REM
21375   REM
21380   REM  TOGGLE INVERSE ON/OFF
```

```
21385  REM
21390  ENTRY$ = ""
21395  IF Y > 0 THEN Y = 0: NORMAL : RETURN : REM  CLEAR INVERSE
21400  INVERSE                    : REM  TURN INVERSE ON
21405  Y = 1                      : REM  SET FLAG
21410  RETURN
21415  REM
21420  REM  ****************************
21425  REM
21430  REM  PAUSE AND ASK FOR MORE?
21435  REM
21440  REM
21445  IF NOPAUSE% > 0 THEN RETURN : REM  PROGRAMMER DOES NOT WANT PAUSE
21450  PRINT                      : REM  CLEAR GET COMMAND
21455  PRINT DSK$: REM  TURN READ OFF
21460  VTAB 23: REM  PAUSE LINE
21465  ENTRY$ = "": REM  MAKE SURE NOTHING HERE
21470  INPUT "DO YOU WISH MORE? ";ENTRY$
21475  HOME : REM  CLEAR THE SCREEN
21480  IF ENTRY$ = "N" THEN ROW% = LINE%: RETURN : REM  THEY WANT OUT
21485  PRINT DSK$;"READ ";HELP$: REM  TURN DISK INPUT BACK ON
21490  XX = 0: REM  RESET PAGE LINE COUNTER
21495  ENTRY$ = "": REM  REMOVE Y
21500  RETURN : REM  GET NEXT LINE
21505  REM
21510  REM  ******************************
21515  REM
```

A DATA ENTRY SCREEN PROCESSOR

INTRODUCTION

Two of the most time-consuming problems encountered when you are developing a program are data entry screens and printed reports. The layout, verification, and modification of these items takes up a significant portion of your time. These two functions, however, really represent the finished product. They are what the user actually sees and interacts with.

Users can appreciate this interface with the computer, and it is this interface—data entry screens and printed reports—that forms their image of the computer, the program, and you. No matter how much energy you put into creating a solution to a problem, the user only sees as far as the input/output. They do not care how flexible you made the program, how easy it is to maintain, or how much thought you put into it.

They only care about how readable, presentable, and understandable the input/output is.

As a programmer, you have two choices: You can accept this fact and give the users whatever they want, or you can give them what you think they need and deal with their complaints. We naturally believe in following the path of least resistance, so this chapter is about a user-friendly and very programmer-friendly data entry screen processor. Chapter 7 will deal with the problem of putting the output information on paper.

The data entry screen is what the user sees and interfaces with. Many users consider the screen a barrier between them and their getting a job done. The screens and their logical flow can make the use of the program an enjoyable, productive task—or an unpleasant chore. The data entry screen is where most of the input errors take place. Thus it is particularly important that this part of your program be understandable, predictable, and forgiving.

In this chapter we design and develop a data entry screen program. This program incorporates both the line editor from Chapter 2 and the help system from Chapter 4. This program is a good example of how we build programs from pieces previously created.

In the following subsections we describe the design and features of the data entry screen program. Then in the remaining sections of the chapter we develop, test, and document this program.

Design

We want the data entry system to be easy for the user to work with. We also want it to be flexible and easily modifiable, with any modifications not seriously impacting the existing program.

The data entry program builds on the routines that have been developed in previous chapters. The routines of this chapter will be combined with those of Chapters 2 and 4 by the EXEC technique (described in Chapter 3 in the section "Merging Programs by Using EXEC") to give you the full data entry screen processor.

Building the Program

Here is the method to use to build the data entry system:

1. Start with a fresh, initialized disk for the program of this chapter.
2. Transfer copies of the programs developed in Chapters 2 and 4 to your new disk (A, or Applesoft, copies), using DOS. Merge them and save the results under the name DES.A.
3. Using the screen editor from Chapter 3, type in the program lines presented in this chapter and save them (these lines will be T, or text, files) under the name DES.T.
4. Using DOS, load DES.A into memory and EXEC the file of this chapter (DES.T), or as much of it as you have entered so far, into memory. Now the two programs are merged and can be saved again on disk as Applesoft files, ready to run the next time you load them.
5. Repeat steps 3 and 4 each time you enter more of the program from this chapter.

User Features

The line editor is used in the data entry system so that all those wonderful editing features, particularly the ability to edit existing data, are available to the user. The entry system allows the user to move up and down through the fields, editing and making corrections. Before exiting the screen, the user is given the chance to verify and correct entries. All of the editing is done without excessive keystrokes or the implication that the user does not know how to operate the computer. (It is never good practice to have the computer program talk down to the user.)

One very useful feature of the data entry system is the use of original, or *default,* values. You may recall that the line editor can either accept new information or be started with an initial value. This feature is used to allow default values for every field in the data entry screen. For example, if the user is entering data not used previously, all the data fields are blank. However, if the user wishes to edit data already entered, the user can actually go to the field of interest and modify it by using all the editing features created in Chapter 2. In contrast, the Apple INPUT statement does not allow the display of a default value or allow the user to edit it.

Programmer Features

For the programmer we want to minimize the amount of work that has to be done to create and modify screens. It is rather pointless and very boring to keep writing the same type of program over and over again (this application is one that most program generators do fairly well). Therefore we want to write one routine, give it the data, and have it process and return the user input without having to worry about the display or the editing. Our data entry system includes these features.

For our data entry system the programmer must enter two routines plus the data entry screen. The data screen processor edits data stored as a string array. For each routine the programmer must write one routine to load the data into the string array and another routine to retrieve the edited data from the array.

The data entry screen is made up of text describing what information is desired plus data fields. (Recall that a *field* is what we call each piece of information that the user will be inputting.) A field's data type, screen position, and length, along with all the general screen text, is stored in a sequential text file (created by using the screen text editor of Chapter 3).

The data entry program also loads and displays the screen. As it is displaying the screen, it extracts each field's characteristics. After it has displayed the text portion of the screen, it displays the original, or default, values of each of the fields and then begins editing in the first field. The program performs these steps for every screen in the program—hence there is no duplicated effort and every screen is of a consistent, high quality.

CREATING A DATA ENTRY SCREEN

The data entry screen processor uses both the line editor and the help subroutines. As mentioned previously, the line editor is more flexible than the INPUT statement. The help subroutine, with a few additional program lines, is used to display the screen text and process the input mask information. By using the help subroutine, you can have highlighted areas, and you do not duplicate the program lines necessary to display

the screen text. Thus you are in the position of being able to implement help with all of your screens without having to do anything special with the programs.

When using the help subroutine, you can utilize ^ (inverse) symbols to highlight areas of special interest. For example, displaying the title of the screen in inverse by enclosing it in ^ symbols is a nice touch. Be careful not to overuse this feature though; overuse can make the screens appear cluttered and confusing.

In addition to containing the text the user is to see, the data screen contains information defining where variables are to be accepted and what their masks will be. For this feature the data mask is enclosed between < and > symbols (less than and greater than). For example, if a ten-character alphabet field is desired, it is represented as

```
<AAAAAAAAAA>
```

Text entry begins after the < symbol (the < and > symbols will not appear on the screen that the user fills out). As an example, Fig. 5.1 illustrates a sample screen for a mailing list program.

FIG. 5.1 Sample data entry screen (saved on disk as CHAP5 SCREEN)

```
                        ^NAME AND ADDRESS^


1.  NAME          <AAAAAAAAAAAAAAAAAAAAAAA>

2.  TITLE         <AAAAAAAAAAAAAAAAAAAAAAA>

3.  ADDRESS       <AAAAAAAAAAAAAAAAAAAAAAA>

4.  CITY          <AAAAAAAAAAAAAAAAAAAAAAA>

5.  STATE         <AA>

6.  ZIP CODE      <##########>

7.  TELEPHONE     <AAAAAAAAAAAAAAAAAAAAAAA>
```

A data entry screen can be created by using the text editor presented in Chapter 3. By using the text editor, you can lay out the screen exactly the way you wish it to appear. This method is easier and faster than the trial-and-error approach necessary when using POKES, HTABs, and VTABs. If the appearance of a screen is to change and the variables that are used in the screen are not changed, then there will be no changes required in the BASIC program. You merely edit the screen, and the next time the screen is used, it will be the new screen. This technique also allows you to easily print copies of the screens so that they can be used as part of the specifications for the project or as part of the user's manual. Even if you have not created as many data entry screens as we have, you can appreciate the ease and flexibility this procedure gives you in creating screens. Having them automatically processed is an added bonus.

SAMPLE VARIABLE-EXCHANGE ROUTINE

The variables used for the example in Fig. 5.1 would have names like NAME$, ADDRESS$, ZIP, and so on. A general-purpose screen editor cannot use these exact names but must work with a string array. So we use the array LINE$( ) for this purpose.

In order for the data screen processor to use actual data, the actual variables must be exchanged with the string array before the data screen is called. After the data is edited, the array is exchanged with the actual variables. The exchange is done by two subroutines for each screen. One moves the data from the variables into the string array, and the other moves the edited array values back into the actual variables. For example, the following routine moves the data for Fig. 5.1 from the variables into the string array:

```
26000   REM  DEFINE CHAP5 SCREEN
26010   REM
26020   REM  FILL SCREEN ARRAY WITH VALUES
26030   REM
26040   LINE$(1) = NAME$
26050   LINE$(2) = TITLE$
26060   LINE$(3) = ADDRESS$
```

```
26070   LINE$(4) = CITY$
26080   LINE$(5) = ST$
26090   LINE$(6) = STR$ (ZIP)
26100   LINE$(7) = TELE$
26110   RETURN
26120   REM  ************************************
```

After the data has been edited and the user exits the data entry screen, the following routine is used to exchange the string array with the actual variables:

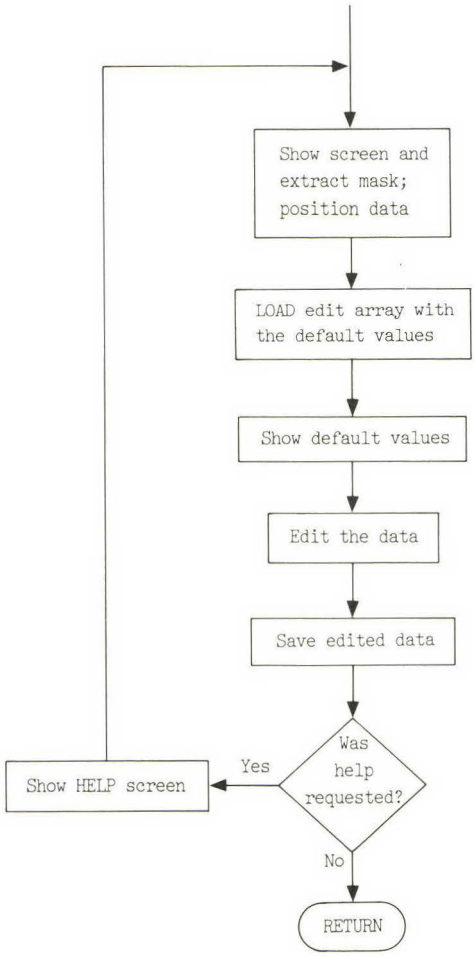
```
26500   REM  DEFINE CHAP5 SCREEN
26510   REM
26520   REM  FILL VALUES FROM SCREEN ARRAY
26530   REM
26540   NAME$ = LINE$(1)
26550   TITLE$ = LINE$(2)
26560   ADDRESS$ = LINE$(3)
26570   CITY$ = LINE$(4)
26580   ST$ = LINE$(5)
26590   ZIP = VAL (LINE$(6))
26600   TELE$ = LINE$(7)
26610   RETURN
26620   REM  ****************************
26630   REM
26640   REM
```

Other than a few minor changes, which are noted in the next section, these routines are all that you have to write to process the screen of Fig. 5.1. A pair of subroutines like these are required for every screen created.

DATA ENTRY PROGRAM

The flowchart for the data entry screen processor is shown in Fig. 5.2. The basic steps are as follows: display the data entry screen, using the help screen processor; load the string edit array with the starting, or de-

FIG. 5.2 Flowchart for data entry screen processor



fault, values and show the default values; edit the data. Next, save the edited values and test to see if help has been requested. If help was requested, then show the HELP screen and redisplay the entire screen. If help was not requested, then return to the calling program.

The following program listing corresponds to the flowchart in Fig. 5.2:

```
20000   REM  DATA ENTRY * SCREEN PROCESSOR
20005   REM
20010   REM
20015   REM
20020   REM  DISPLAYS SCREEN, LOADS MASK DATA
20025   REM  DISPLAYS DEFAULT VALUES
20030   REM  EDITS AND SAVES VALUES
20035   REM
20040   REM  VARIABLES USED:
20045   REM    LINE$()   HOLDS EDIT DATA
20050   REM    ITEM%     NUMBER TO EDIT
20055   REM    PAGE%     PAGE TO EDIT
20060   REM    SROW%()   FIELD ROW NUMBER
20065   REM    SCOL%()   FIELD COL NUMBER
20070   REM    SMASK$()  FIELD MASK$
20075   REM    SCREEN$() NAME OF SCREEN
20080   REM    LINE%     CURRENT LINE BEING EDITED
20085   REM
20090   REM
20095   REM
20100   REM
20105   REM  EDIT A DATA SCREEN
20110   REM
20115   REM  SHOW THE DATA SCREEN
20120   REM
20125   ITEM% = 0                  : REM  CLEAR NUMBER OF ITEMS
20130   NOPAUSE% = 1               : REM  INFORM HELP SCREEN NOT TO PAUSE
20135   COL% = 1                   : REM  RESET POSITION COUNTER
20140   HELP$ = SCREEN$(PAGE%)     : REM  NAME OF SCREEN TO PROCESS
20145   GOSUB 21000                : REM  SHOW SCREEN
20150   NOPAUSE% = 0               : REM  RESET TO PAUSE
20155   ON PAGE% GOSUB 25000,26000
20160   GOSUB 20295                : REM  SHOW DEFAULT VALUES
20165   GOSUB 20350                : REM  EDIT DATA
20170   ON PAGE% GOSUB 25500,26500: REM  SAVE THE EDITED DATA
20175   IF HELP% > 0 THEN HELP$ = HELP$ + " HELP": GOSUB 21000 :
          GOTO 20000               : REM  SHOW HELP SCREEN AND START OVER
```

```
20180   RETURN
20185   REM
20190   REM  ****************************
20195   REM
20200   REM
```

Various aspects of the data screen entry processor are discussed in the following subsections.

Explanation of the Program

Lines 20155 and 20170 are GOSUBs to the program sections that load and retrieve the data from the screen processor. This program allows multiple screens to be processed by the subroutine. The screen you wish to process is selected by setting PAGE% to the appropriate value. For example, to use the screen you entered for Fig. 5.1, starting on line 26000, you would set PAGE% equal to 2. (*Note:* We have not created a screen for lines 25000; this task is left as an exercise for you.) If you wish to use more than two screens, then simply add these line numbers to lines 20155 and 20170. If only one screen is being processed, replace the ON GOSUB commands with a GOSUB command.

If the user requests help, line 20175 will create a help text file name and call the help routine to display the text. We are adopting the convention of adding HELP to the end of the screen name to create a name of the screen's help text. For example, if the data entry screen has the name MAIL LIST, then the help text will have the name MAIL LIST HELP. If you choose to use a different convention, then modify this line.

Explanation of Variables

NOPAUSE% (line 20130) and HELP$ (line 20140) are used by the help subroutine while displaying the screen. If NOPAUSE% is not equal to 0, then the help routine will not ask DO YOU WISH MORE? at the end of the file. HELP$ is the name of the data entry screen.

PAGE% (line 20140) and SCREEN$( ) are used in multiple-screen processing to define which data screen is being processed. If there is only

one screen, you will not need these variables. Just assign the screen name directly to HELP$.

This data entry program uses several arrays that must be dimensioned before they are used. In the test routine (presented in the next section) they are dimensioned on lines 1030 through 1080. But in your program you may need to put them elsewhere. The arrays are as follows:

```
1030   LAST% = 10              : REM  (OR WHATEVER SIZE IS REQUIRED)
1040   DIM LINE$(LAST%)
1050   DIM SROW%(LAST%)
1060   DIM SCOL%(LAST%)
1070   DIM SMASK$(LAST%)
1080   DIM SCREEN$(LAST%)
```

LAST% is the maximum number of fields allowed. LINE$( ) holds the values of the fields being edited. SROW%( ) and SCOL%( ) contain the screen coordinates of each field. SMASK$( ) is the data entry mask, and SCREEN$( ) has the actual name of each screen.

CHANGES TO THE HELP SUBROUTINE

Four lines must be added to the help subroutine so that it can process the field masks or definitions. These lines are as follows:

```
21262   IF ENTRY$ = "<" THEN GOSUB 20205 : REM  ASSIGN FIELD CHARACTERISTICS
21263   IF ENTRY$ < > CHR$ (13) THEN COL% = COL% + 1 : REM  INC COLUMN
          POSITION COUNTER
21286   COL% = 1              : REM  RESET COLUMN COUNTER
21457   IF NOPAUSE% <  > 0 THEN PRINT DSK$;"CLOSE ";SCREEN$: RETURN : REM
          RETURN WITHOUT A PAUSE
```

These lines recognize the < symbol and increment or set the screen column position counter, COL%. Also, a line is added to close the file when NOPAUSE% does not equal 0.

A < symbol is used to mark the beginning of a field definition. When it is encountered, a branch is made to a subroutine that sets the field parameters, GOSUB 20205.

SUBROUTINE FOR SETTING THE FIELD PARAMETERS

The field parameter routine sets the screen row and column coordinates and the edit mask for the field. It continues stepping across the text line one character at a time searching for the > symbol that marks the end of the mask. All the characters in between the symbols are moved into the field mask.

The program looks like this:

```
20205   REM  SET FIELD PARAMETERS
20210   REM
20215   ITEMS% = ITEMS% + 1        : REM  INC FIELD COUNTER
20220   SMASK$(ITEMS%) = ""        : REM  CLEAR IT
20225   SROW%(ITEMS%) = ROW% + 1   : REM  CURRENT ROW NUMBER
20230   SCOL%(ITEMS%) = COL%       : REM  CURRENT COLUMN NUMBER
20235   PRINT " ";                 : REM  PRINT SPACE
20240   Z = Z + 1
20245   ENTRY$ = MID$ (A$,Z,1)     : REM  GET ONE CHARACTER
20250   IF ENTRY$ = ">" THEN GOTO 20270 : REM  ARE WE AT END OF MASK?
20255   SMASK$(ITEM%) = SMASK$(ITEMS%) + ENTRY$ : REM  ADD TO FIELD MASK
20260   COL% = COL% + 1            : REM  INC COL CNT
20265   GOTO 20235                 : REM  GET NEXT CHAR
20270   ENTRY$ = " "               : REM  CLEAR ENTRY$
20275   RETURN
20280   REM
20285   REM  ***************
20290   REM
```

In the program above three arrays plus one counter are used to contain the field parameters. In lines 20225 and 20230 the integer arrays SROW%( ) and SCOL%( ) contain the starting screen coordinates for the fields. These arrays will be assigned to ROW% and COL% when the line editor routine is called. SMASK$( ) in line 20200 is a string array used to contain the mask for the fields. MASK$ will be set from this array. Finally, ITEMS% (line 20215) is used to count the number of fields on the screen. ITEMS% is incremented by one as each field is processed. You may have noticed that ITEMS% is reset to 0 before the screen display subroutine is called.

TEST POINT

At this point you should have entered all the programs presented thus far. Now enter the following program and the data screen shown in Fig. 5.1 (saved as CHAP5 SCREEN). After you enter RUN (CR), this screen should be displayed. The program will stop on line 20160 because the default display routine has not been entered yet.

The following test routine for the data entry screen program is designed for only 10 fields and will display the results of the editing. The first time the program is run, the data screen will be blank; the second and subsequent times it will display the values of the previous edit sessions as defaults.

The test routine is as follows:

```
1000   REM  TEST PROGRAM FOR DATA SCREEN PROCESSOR
1010   REM
1020   REM
1030   LAST% = 0
1040   DIM LINE$(LAST%)
1050   DIM SROW%(LAST%)
1060   DIM SCOL%(LAST%)
1070   DIM SMASK$(LAST%)
1080   DIM SCREEN$(LAST%)          : REM  SCREEN NAMES
1090   REM
1100   REM
1110   REM
1120   PAGE% = 2                   : REM  ENTER CHAP5 SCREEN
1130   SCREEN$(2) = "CHAP5 SCREEN"
1140   GOSUB 20000                 : REM  EDIT THE DATA
1150   HOME
1160   PRINT "NAME",NAME$
1170   PRINT "TITLE",TITLE$
1180   PRINT "ADDRESS",ADDRESS$
1190   PRINT "CITY",CITY$
1200   PRINT "STATE",ST$
1210   PRINT "ZIP CODE",ZIP
1220   PRINT "TELEPHONE",TELE$
1230   VTAB 23
1240   POKE 36, 1                  : REM  HTAB
```

```
1250   INPUT "ENTER RETURN TO CONTINUE ";A$
1260   GOTO 1120      : REM  THAT FELT SO GOOD LET'S DO IT AGAIN
1270   REM  ***********************************
1280   REM
1290   REM
```

DISPLAYING THE ORIGINAL VALUES

After the text is displayed and LINE$( ) has been loaded with the original or default values, subroutine GOSUB 20295 is called to display these values. By displaying the values, we are presenting the user with a complete picture of what data the computer currently contains. This technique is better than the method of serially showing and editing one field at a time. By being shown all the information at once, the user has a better understanding of what is being requested.

The display routine uses a FOR-NEXT loop to position the cursor from the values in SROW%( ) and SCOL%( ) and then prints the corresponding value from LINE$( ). The program listing is as follows:

```
20295   REM  SHOW DEFAULT VALUES
20300   REM
20305   FOR X = 1 TO ITEMS%
20310   VTAB SROW%(X)                  : REM  LINE
20315   POKE 36, SCOL%(X)              : REM  COLUMN - HTAB
20320   PRINT LINE$(X);                : REM  DATA
20325   NEXT X
20330   RETURN
20335   REM
20340   REM  ******************************
20345   REM
```

TEST POINT

After the display subroutine is entered, the program should display the screen and stop at line 20165. Since values have not been assigned to LINE$( ), no default will be shown. As an exercise, you might temporarily

add the following lines and RUN the program again just to make sure everything is correct.

```
1131   LINE$(1) = "NAME"
1132   LINE$(2) = "TITLE"
1133   LINE$(3) = "ADDRESS"
1134   LINE$(4) = "CITY"
1135   LINE$(5) = "STATE"
1136   LINE$(6) = "ZIP CODE"
1137   LINE$(7) = "PHONE NUMBER"
```

To prevent confusion later, delete these lines after a successful test.

EDITING SUBROUTINE

Once the screen text and the values are displayed, all that remains is to edit the individual fields. The line editor is used, because it allows editing in an existing field and offers cursor controls not available with INPUT. So that the up arrow, down arrow, and ESC can be used, the following program lines must be added to the standard line editor routine:

```
51124   IF KEY% = 10 THEN CTRL% = 2 : REM  ^J LINE FEED 51124
51126   IF KEY% = 11 THEN CTRL% = 3 : REM  ^K UP ARROW EXIT 51126
```

Figure 5.3 (page 141) is a flowchart of the field-editing subroutine, which is as follows:

```
20350   REM  EDIT THE DATA FIELDS
20355   REM
20360   LINE% = 1                 : REM  START IN DATA FIELD
20365   ENTRY$ = LINE$(LINE%)     : REM  FIELD
20370   ROW% = SROW%(LINE%)       : REM  ROW
20375   COL% = SCOL%(LINE%)       : REM  COL
20380   MASK$ = SMASK$(LINE%)     : REM  MASK
20385   GOSUB 50000               : REM  EDIT FIELD
20390   LINE$(LINE%) = ENTRY$     : REM  SAVE THE EDITED DATA FIELD
```

```
20395   IF HELP% > 0 THEN RETURN : REM  HELP REQUESTED IN THE FIELD
20400   IF (CTRL% = 3) AND (LINE% > 1) THEN LINE% = LINE% - 1 :
          GOTO 20365              : REM  UP ARROW
20405   IF CTRL% = 3 THEN GOTO 20365 : REM  UP ARROW BUT ALREADY AT TOP
20410   IF CTRL% = 27 THEN GOTO 20425 : REM  ESC SO GO TO BOTTOM
20415   IF LINE% < ITEMS% THEN LINE% = LINE% + 1: GOTO 20365: REM  MOVE DOWN A LINE
20420   REM
20425   REM  VERIFY ENTRIES
20430   REM
20435   VTAB 24                 : REM  GOTO BOTTOM
20440   HTAB 10
20445   PRINT "CHANGE WHICH ITEM?";
20450   MASK$ = "##"            : REM  ALLOW HELP AND UP TO 99 FIELDS
20455   ENTRY$ = "0"            : REM  DEFAULT
20460   ROW% = 24
20465   COL% = 30
20470   GOSUB 50000             : REM  EDIT DATA
20475   IF CTRL% = 3 THEN LINE% = ITEMS%: GOTO 20365: REM  UP ARROW
20480   LINE% = VAL (ENTRY$)    : REM  LINE TO EDIT
20485   IF LINE% = 0 THEN RETURN : REM  ALL DONE WITH THIS SCREEN
20490   IF (LINE% < = ITEMS%) AND (LINE% > 0) THEN GOTO 20365 : REM  EDIT
          THE REQUESTED FIELD
20495   GOTO 20425              : REM  BAD ENTRY
20500   REM
20505   REM  ****************************
20510   REM
```

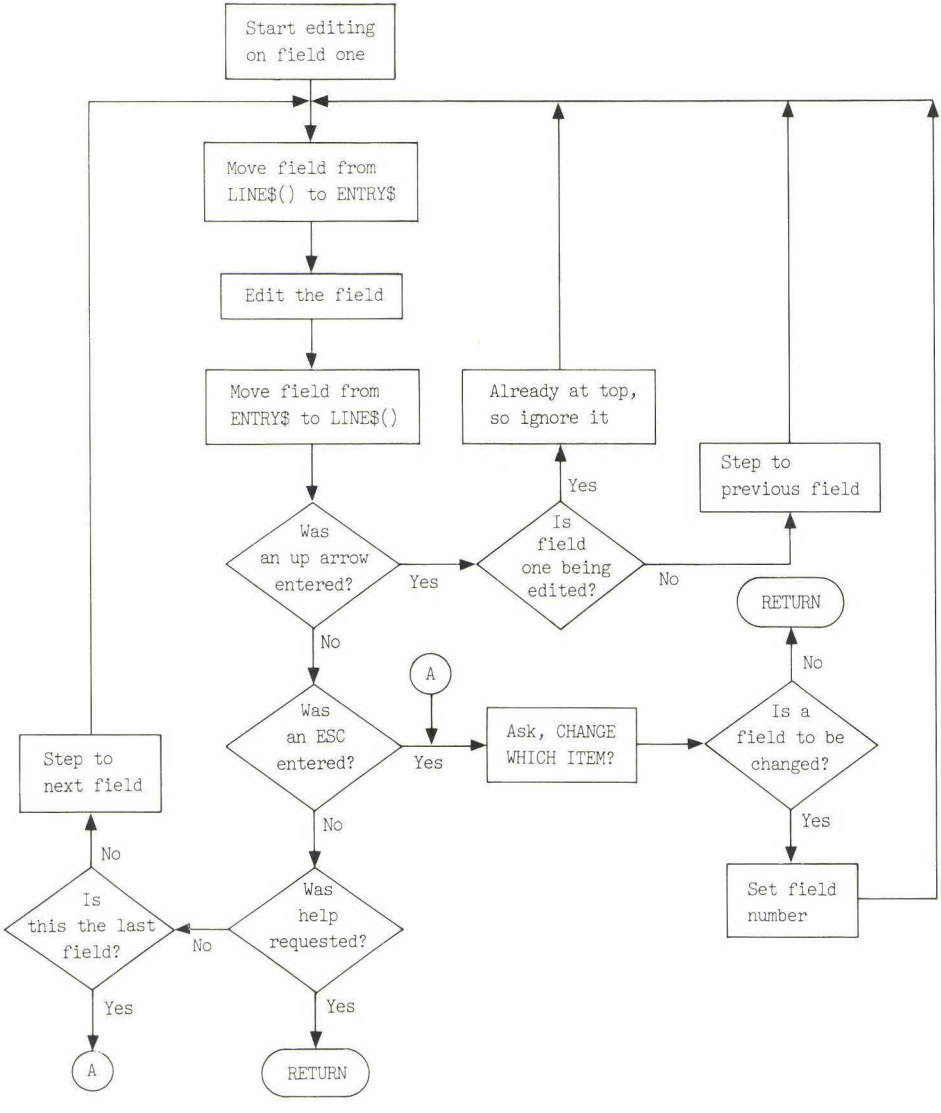
Editing begins at the first field, and LINE% (line 20360) is used to mark the field being edited. Next, the variables required for the line editor and ENTRY$ are set. After editing, the contents of ENTRY$ are returned to LINE$( ). Then a check is made to see if the user entered an up arrow or an ESC or requested help. If none of these requests were made, then the program steps to the next field.

After the last field has been edited, or an ESC has been entered, the user is asked,

```
CHANGE WHICH ITEM?
```

If either 0 (CR) or (CR) is entered, then the editing is completed and the program returns to the main routine. Otherwise, the cursor is moved to the field requested.

FIG. 5.3 Flowchart for field-editing routine



The up arrow and ESC are user-friendly, laborsaving features. The user does not have to enter a RETURN for every field on the screen just to get to the CHANGEs line, and it is not necessary to move to the bottom of the screen in order to move up a variable. You may have noticed that the user can enter an up arrow on the CHANGEs line in order to move to the last field. It is often easier to enter several up arrows than to find and enter a field number.

TEST POINT

The data entry system is now complete. You will now want to test the up arrow (^K) and ESC keys. Also, verify that a field number can be entered on the CHANGEs line and that the field can be edited.

After you enter (CR) on the CHANGEs line, you will be asked by the test routine to ENTER RETURN TO CONTINUE. After you enter this (CR), you will be looped back to the beginning of the data entry screen, and the values you just entered should be displayed as the new defaults.

Before you test the help feature, you will have to create a text file named PAGE 2 HELP. This file can be created by using the text editor from Chapter 3 and can contain any of the help features developed in Chapter 4. After the help screen is displayed and you wish to return to the data entry screen, the screen should be cleaned and the current screen redisplayed.

ADDITIONAL OPTION

In our editing subroutine we chose to begin editing with the first field. You may wish to begin editing with the CHANGEs line instead. When you are editing a blank screen with no defaults, then you will want to begin editing at field one. When you are editing an existing item, then you will wish to begin editing at the CHANGEs line.

If you allow for both alternatives, you have the option of using the editing screen to review data. In addition, one user keystroke, ESC, is removed. This option can be implemented by changing line 20165 to branch

to either 20350 or 20425 depending on a variable set by the routine that called the screen editor. For example, you could use

```
20165   ON EDITSTART% GOSUB 20350,20425
```

where EDITSTART% equals 1 to start in field one and 2 to start on the CHANGEs line.

USER INSTRUCTIONS

The following subsections contain the user instructions for the data entry system. Please add these instructions to your user's manual.

Entering and Editing Data

All data entry screens function in the same manner. They all have features that make it easier for you to edit and change data. The data entry screen consists of three parts: (1) the text used to describe the screen; (2) the data fields, i.e., the actual data you can edit; and (3) a line at the bottom of the screen that asks,

```
CHANGE WHICH ITEM?
```

We refer to this line as the CHANGEs line.

Portions of the text may be highlighted and appear as black letters on a white background.

In addition to all the editing capabilities described in the line editor chapter, you can move up and down through the fields or jump directly to the bottom of the screen to the CHANGEs line.

Editing a Field

Whenever a field is being edited, its current value is shown. If you do *not* wish to change the field, then enter a RETURN or a line feed (control J, ^J) and you will move to the next field. If you *do* wish to change a field, then

just change it by using the various editing commands. Remember that the field is accepted exactly as you see it, so do not leave out or forget anything.

Moving Between Fields

If you are in a field and wish to go to the next field, enter either a RETURN or a line feed (^J). If you wish to go to the previous field, then enter an up arrow (^K). You may step up and down through the fields as often as necessary to correct the entries.

How to Exit the Data Entry Screen

If you are editing fields and wish to stop editing and go to the CHANGEs line, you may either step down through the fields by entering RETURNs or jump across all the fields directly to the CHANGEs line by pushing the ESC key.

CHANGE WHICH ITEM?

The CHANGE WHICH ITEM? question is asked at the bottom of every data entry screen. If you wish to change a field, you enter its number followed by a RETURN. The program will then jump to the field you requested.

An up arrow (^K) can be used to step up from the CHANGEs line, one field at a time, to the field you wish to change.

If you do not wish to make any corrections, then enter a RETURN and the program will proceed.

Help Requests

All data entry screens have help text to explain what information the screen wants and what each of the fields means. To request help, go to the CHANGEs line and press control Q (^Q). After the help text has been displayed, the original screen will be displayed and you may edit the data.

COMPLETE DATA ENTRY SCREEN PROGRAM

The complete listing of the data entry program is as follows:

```
1000    REM  TEST PROGRAM FOR DATA SCREEN PROCESSOR
1010    REM
1020    REM
1030    LAST% = 10
1040    DIM LINE$(LAST%)
1050    DIM SROW%(LAST%)
1060    DIM SCOL%(LAST%)
1070    DIM SMASK$(LAST%)
1080    DIM SCREEN$(LAST%)          : REM  SCREEN NAMES
1090    REM
1100    REM
1110    REM
1120    PAGE% = 2                   : REM  ENTER CHAP5 SCREEN
1130    SCREEN$(2) = "CHAP5 SCREEN"
1140    GOSUB 20000                 : REM  EDIT THE DATA
1150    HOME
1160    PRINT "NAME",NAME$
1170    PRINT "TITLE",TITLE$
1180    PRINT "ADDRESS",ADDRESS$
1190    PRINT "CITY",CITY$
1200    PRINT "STATE",ST$
1210    PRINT "ZIP CODE",ZIP
1220    PRINT "TELEPHONE",TELE$
1230    VTAB 23
1240    POKE 36, 1                  : REM  HTAB
1250    INPUT "ENTER RETURN TO CONTINUE ";A$
1260    GOTO 1120                   : REM  LET'S DO IT AGAIN
1270    REM  ***********************************
1280    REM
1290    REM

26000   REM  DEFINE CHAP5 SCREEN
26010   REM
26020   REM  FILL SCREEN ARRAY WITH VALUES
26030   REM
26040   LINE$(1) = NAME$
26050   LINE$(2) = TITLE$
```

```
26060   LINE$(3) = ADDRESS$
26070   LINE$(4) = CITY$
26080   LINE$(5) = ST$
26090   LINE$(6) = STR$ (ZIP)
26100   LINE$(7) = TELE$
26110   RETURN
26120   REM  ************************************
26500   REM  DEFINE CHAP5 SCREEN
26510   REM
26520   REM  FILL VALUES FROM SCREEN ARRAY
26530   REM
26540   NAME$ = LINE$(1)
26550   TITLE$ = LINE$(2)
26560   ADDRESS$ = LINE$(3)
26570   CITY$ = LINE$(4)
26580   ST$ = LINE$(5)
26590   ZIP = VAL (LINE$(6))
26600   TELE$ = LINE$(7)
26610   RETURN
26620   REM  ******************************
26630   REM
26640   REM

20000   REM  DATA ENTRY * SCREEN PROCESSOR
20005   REM
20010   REM
20015   REM
20020   REM  DISPLAYS SCREEN, LOADS MASK DATA
20025   REM  DISPLAYS DEFAULT VALUES
20030   REM  EDITS AND SAVES VALUES
20035   REM
20040   REM  VARIABLES USED:
20045   REM    LINE$()   HOLDS EDIT DATA
20050   REM    ITEM%     NUMBER TO EDIT
20055   REM    PAGE%     PAGE TO EDIT
20060   REM    SROW%()   FIELD ROW NUMBER
20065   REM    SCOL%()   FIELD COL NUMBER
20070   REM    SMASK$()  FIELD MASK$
20075   REM    SCREEN$() NAME OF SCREEN
20080   REM    LINE%     CURRENT LINE BEING EDITED
20085   REM
```

```
20090   REM
20095   REM
20100   REM
20105   REM  EDIT A DATA SCREEN
20110   REM
20115   REM  SHOW THE DATA SCREEN
20120   REM
20125   ITEM% = 0                  : REM  CLEAR NUMBER OF ITEMS
20130   NOPAUSE% = 1               : REM  INFORM HELP SCREEN NOT TO PAUSE
20135   COL% = 1                   : REM  RESET POSITION COUNTER
20140   HELP$ = SCREEN$(PAGE%)     : REM  NAME OF SCREEN TO PROCESS
20145   GOSUB 21000                : REM  SHOW SCREEN
20150   NOPAUSE% = 0               : REM  RESET TO PAUSE
20155   ON PAGE% GOSUB 25000,26000
20160   GOSUB 20295                : REM  SHOW DEFAULT VALUES
20165   GOSUB 20350                : REM  EDIT DATA
20170   ON PAGE% GOSUB 25500,26500: REM  SAVE THE EDITED DATA
20175   IF HELP% > 0 THEN HELP$ = HELP$ + " HELP": GOSUB 21000 :
          GOTO 20000               : REM  SHOW HELP SCREEN AND START OVER
20180   RETURN
20185   REM
20190   REM  ******************************
20195   REM
20200   REM
20205   REM  SET FIELD PARAMETERS
20210   REM
20215   ITEMS% = ITEMS% + 1        : REM  INC FIELD COUNTER
20220   SMASK$(ITEMS%) = ""        : REM  CLEAR IT
20225   SROW%(ITEMS%) = ROW% + 1   : REM  CURRENT ROW NUMBER
20230   SCOL%(ITEMS%) = COL%       : REM  CURRENT COLUMN NUMBER
20235   PRINT " ";                 : REM  PRINT SPACE
20240   Z = Z + 1
20245   ENTRY$ = MID$ (A$,Z,1)     : REM  GET ONE CHARACTER
20250   IF ENTRY$ = ">" THEN GOTO 20270 : REM  ARE WE AT END OF MASK?
20255   SMASK$(ITEM%) = SMASK$(ITEMS%) + ENTRY$ : REM  ADD TO FIELD MASK
20260   COL% = COL% + 1            : REM  INC COL CNT
20265   GOTO 20235                 : REM  GET NEXT CHAR
20270   ENTRY$ = " "               : REM  CLEAR ENTRY$
20275   RETURN
20280   REM
20285   REM  ******************************
```

```
20290   REM
20295   REM  SHOW DEFAULT VALUES
20300   REM
20305   FOR X = 1 TO ITEMS%
20310        VTAB SROW%(X)          : REM  LINE
20315        POKE 36, SCOL%(X)      : REM  COLUMN - HTAB
20320        PRINT LINE$(X);        : REM  DATA
20325   NEXT X
20330   RETURN
20335   REM
20340   REM  ****************************
20345   REM
20350   REM  EDIT THE DATA FIELDS
20355   REM
20360   LINE% = 1                   : REM  START IN DATA FIELD
20365   ENTRY$ = LINE$(LINE%)       : REM  FIELD
20370   ROW% = SROW%(LINE%)         : REM  ROW
20375   COL% = SCOL%(LINE%)         : REM  COL
20380   MASK$ = SMASK$(LINE%)       : REM  MASK
20385   GOSUB 50000                 : REM  EDIT FIELD
20390   LINE$(LINE%) = ENTRY$       : REM  SAVE THE EDITED DATA FIELD
20395   IF HELP% > 0 THEN RETURN    : REM  HELP REQUESTED IN THE FIELD
20400   IF (CTRL% = 3) AND (LINE% > 1) THEN LINE% = LINE% - 1 :
          GOTO 20365                : REM  UP ARROW
20405   IF CTRL% = 3 THEN GOTO 20365  : REM  UP ARROW BUT ALREADY AT TOP
20410   IF CTRL% = 27 THEN GOTO 20425 : REM  ESC SO GO TO BOTTOM
20415   IF LINE% < ITEMS% THEN LINE% = LINE% + 1: GOTO 20365: REM  MOVE
          DOWN A LINE
20420   REM
20425   REM  VERIFY ENTRIES
20430   REM
20435   VTAB 24                     : REM  GOTO BOTTOM
20440   HTAB 10
20445   PRINT "CHANGE WHICH ITEM?";
20450   MASK$ = "##"                : REM  ALLOW HELP AND UP TO 99 FIELDS
20455   ENTRY$ = "0"                : REM  DEFAULT
20460   ROW% = 24
20465   COL% = 30
20470   GOSUB 50000                 : REM  EDIT DATA
20475   IF CTRL% = 3 THEN LINE% = ITEMS%: GOTO 20365: REM  UP ARROW
20480   LINE% = VAL (ENTRY$)        : REM  LINE TO EDIT
```

```
20485   IF LINE% = 0 THEN RETURN : REM  ALL DONE WITH THIS SCREEN
20490   IF (LINE% < = ITEMS%) AND (LINE% > 0) THEN GOTO 20365 : REM  EDIT
          THE REQUESTED FIELD
20495   GOTO 20425                  : REM  BAD ENTRY
20500   REM
20505   REM  ****************************
20510   REM
21262   IF ENTRY$ = "<" THEN GOSUB 20205 : REM  ASSIGN FIELD CHARACTERISTICS
21263   IF ENTRY$ <  > CHR$ (13) THEN COL% = COL% + 1  : REM  INC COLUMN
          POSITION COUNTER
21286   COL% = 1                    : REM  RESET COLUMN COUNTER
21457   IF NOPAUSE% <  > 0 THEN PRINT DSK$;"CLOSE ";SCREEN$: RETURN : REM
          RETURN WITHOUT A PAUSE
51124   IF KEY% = 10 THEN CTRL% = 2  : REM  ^J LINE FEED 51124
51126   IF KEY% = 11 THEN CTRL% = 3  : REM  ^K UP ARROW EXIT 51126
```

CHAPTER 6

A MENU SYSTEM

INTRODUCTION

In this chapter we develop a menu display program. A *menu* is a list of actions the computer can perform. The user selects one action, and then either a particular portion of the current program is executed or an entirely new program is loaded and executed. Almost all programs have at least one menu. From a programming standpoint a menu is similar to a data entry screen: It is a simple (and boring) program to write and time-consuming to adjust and modify.

The menu system presented in this chapter is based on the concepts and techniques developed in the previous chapters. The text editor is used to create a menu screen. Imbedded within the text of this screen is information about what programs are to be executed when a particular

option is selected. As for the data entry screen, the help subroutine is used to display the menu. This routine allows highlighting of important information and provides consistency for all of the screens.

In the following subsections we describe the program design and its features.

Design

Depending on how we wish to implement the menu driver, we should be able to either chain to and run another program or branch to a subroutine within the current program. The menu program we present allows for these options. In addition, the program builds on the routines that have been developed in the previous chapters. That is, the routines of this chapter are combined with those of Chapters 2 and 4 by the EXEC technique described in Chapter 3 (see the "Merging Programs by Using EXEC" section) to give you the complete menu system.

Building the Program

Here is the method to use to build the menu program:

1. Start with a fresh, initialized disk for the program of this chapter.
2. Transfer copies of the programs developed in Chapters 2 and 4 to your new disk (A, or Applesoft, copies), using DOS. Merge them and save the results under the name MENU.A.
3. Using the screen editor from Chapter 3, type in the program lines presented in this chapter and save them (these lines will be T, or text, files) under the name MENU.T.
4. Using DOS, load MENU.A into memory and EXEC the file of this chapter (MENU.T), or as much of it as you have entered so far, into memory. Now the two programs are merged and can be saved again on disk as Applesoft files, ready to run the next time you load them.
5. Repeat steps 3 and 4 each time you enter more of the program from this chapter.

User Features

The menu is the user's road map. Without a menu to remind them about what options are available, most users would be hopelessly lost. The menu text must clearly and unambiguously describe what options are available to the user and what the consequences of a particular selection are. A help file, such as we have provided, is therefore absolutely essential with every menu.

In a menu system it is important that consistency be maintained. In our menus we always use the ESC key to step the user back to the previous menu. By knowing this convention, the users will always be able to retrace their steps and return to the beginning of the program. Another technique we always include is an option on every menu that will return the user to the first, or "master," menu.

Our menu selections are always numbered, and a carriage return must be entered every time a selection is made. Occasionally, you may come across a program that requires a carriage return in response to certain questions and none in others. For example, in one place in the program you may have to enter a 1 (CR), while in another similar situation a simple 1 is all that is necessary. The computer automatically adds the (CR). Such a program is a prime example of inconsistent programming, and most users find this inconsistency annoying, irritating, and irrational. Unless a program like this one is used on a daily basis, the user is always entering the unneeded carriage return and accidently causing an undesired action.

Remember, user-friendly software contains no surprises or hidden pitfalls and is consistent. A good menu should provide your users with the visibility necessary to really understand where they are going and why.

Programmer Features

The menu routine can be written by using either one of two methods. Method 1 automatically chains to and runs another program, while method 2 causes a branch to a routine within the current program.

In method 1 the programmer includes the names of the programs to be executed with the actual menu text. The help screen display routine from Chapter 4 is modified to extract the names and not display them.

Method 2 requires either an ON GOSUB or an ON GOTO statement to branch to the appropriate routine within the current program. For either option the programmer simply passes the name of the desired menu screen to the menu routine and it takes over from there.

The program names may be placed on any line of the screen file. A name must be between two # symbols, begin on column 1, and contain the option number in columns 2 and 3. For example,

```
#01   ACCOUNTS RECEIVABLE#

#02   GENERAL LEDGER#

#03   PAYROLL#
```

This listing means that accounts receivable is menu option 1, general ledger is option 2, etc.

The # symbol was chosen in our program to avoid a conflict with the < and > symbols used for the data entry screen, just in case a program contains both a menu and a data entry screen. The choice of symbols is completely arbitrary, and if these symbols conflict with the way you use the data entry or menu screens, then change the symbols. To avoid problems, try to be consistent with your choice of symbols so that all the screens of a given type use the same style.

MENU PROGRAM

A flowchart of the menu program is shown in Fig. 6.1. This program is very simple. It first uses the help screen display subroutine to display the text and to strip out the options and the names of the programs to chain to or run. It then asks the user to select an option. After verifying that a valid option number has been entered, the menu either runs the requested program or branches somewhere within the current program, depending on what line 22160 (see below) of the menu contains.

The program listing is as follows:

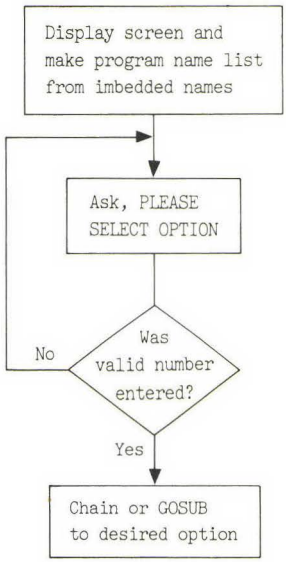
```
22000   REM  MENU DRIVER *
22005   REM
22010   REM
22015   REM
```

```
22020   REM  DISPLAYS MENU AND CHAINS TO PROGRAM OF USERS CHOICE
22025   REM
22030   REM
22035   REM  IMPORTANT VARIABLES USED:
22040   REM       LINE$() CONTAINS NAME OF PROGRAM TO CHAIN TO
22045   REM
22050   DSK$ = CHR$ (4)            : REM  DISK ^D
22055   ITEMS% = 0                 : REM  NUMBER OF OPTIONS
22060   NOPAUSE% = 1               : REM  INFORM HELP SYSTEM NOT TO PAUSE
22065   HELP$ = SCREEN$            : REM  SEND THE MENU NAME
22070   GOSUB 21000                : REM  SHOW THE SCREEN USING HELP ROUTINE
22075   NOPAUSE% = 0               : REM  RESTORE THE FLAG FOR OTHERS
22080   REM
22085   REM  ASK FOR OPTION
22090   REM
22095   VTAB 3
22100   POKE 36, 10                : REM  HTAB
22105   PRINT "PLEASE SELECT OPTION"
22110   ROW% = 3
22115   COL% = 35
22120   MASK$ = "##"               : REM  ALLOW HELP REQUEST
22125   ENTRY$ = "0"
22130   GOSUB 50000                : REM  ACCEPT OPTION
22135   IF HELP% THEN HELP$ = SCREEN$ + " HELP": GOSUB 21000 :
          GOTO 22000: REM  RESPONDED TO HELP REQUEST
22140   X = VAL (ENTRY$)           : REM  OPTION SELECTED
22145   IF X > ITEMS% THEN GOTO 22000: REM  BAD ENTRY
22150   IF LINE$(X) = "END" THEN HOME: END : REM  RETURN TO BASIC
22152   IF LINE$(X) = "HELP" THEN HELP% = 1:HELP$ = SCREEN$ + " HELP": GOSUB
          21000: GOTO 22000: REM  RESPONDED TO HELP REQUEST
22155   PRINT                      : REM  CLEAR FOR DISK COMMAND
22160   PRINT DSK$;"RUN ";LINE$(X): REM  CHAIN TO THE REQUESTED PROGRAM
22165   REM
22170   REM  ***********************************
22175   REM
```

EXPLANATION OF PROGRAM

The menu routine contains a feature that terminates execution and returns to BASIC. This task is accomplished by using the word END in place of the program name. Line 22150 tests to see if the selected option con-

FIG. 6.1 Menu program flowchart



sists of END for the program name; if it does, then the program clears the screen and stops the program with an END statement.

The menu routine also contains a feature that allows you to call HELP. This task is accomplished by using the word HELP in place of the program name. Line 22152 tests to see if the selected option consists of HELP for the program name; if it does, then the program clears the screen and loads and displays the requested HELP screen.

The default option number assigned on line 22125 is 0. We usually use 0 (CR) and ESC to mean the same thing—go back to the previous menu. Thus those users not familiar enough with the programs to remember to use ESC can still exit the programs with a single keystroke, a carriage return (since 0 is defaulted). Also, since this line always has the same meaning, it is positioned as the last option on the list instead of the first option. When it is at the end of the list, the user is not forced to read it every time a menu appears. This feature is a small touch, but it shows that you have put some thought into the menus and attempt to make them consistent and easy to use.

The menu routine uses the LINE$( ) array. This array must be dimensioned to at least the maximum option number before the menu routine is called. If you are also using the data entry screen, it is not necessary to dimension the array twice. If needed, be sure to place it at the front of the program so that it only executes once.

Other features of the menu program are described in the following subsections.

Chaining or Branching

Line 22160 currently is

```
22160   PRINT DSK$;"RUN ";LINE$(X): REM  CHAIN TO THE REQUESTED PROGRAM
```

This line will cause the menu to run another program once a valid option has been selected. If you wish to branch to a point within the current program, this line should be changed as follows:

```
22160   ON X GOSUB 1000,2000,3000,ETC : REM  BRANCH TO SUBROUTINE
```

where 1000, 2000, 3000, ETC are the subroutine entry points. Do not forget to change these numbers to the correct line numbers in your program.

You will also have to add some lines at the end of your subroutines to either terminate the program on the return or redisplay the menu. For example,

```
22165   END : REM  TERMINATE EXECUTION
```

will terminate the program, and

```
22165   GOTO 22000 : REM  REDISPLAY THE MENU
```

will cause the menu to be redisplayed.

If you are branching to subroutines and not chaining to any other programs, then you do not need to put any program names in your menu screen. It can contain just the text you wish to display.

Finally, line 22145 must be deleted if you are branching since you are not checking program names and ITEMS% is not being set properly.

Accepting a Program Name

When the screen display routine encounters a # symbol, it branches to line 22180, where the program name is extracted and inserted into the LINE$( ) array. ITEM% contains the value of the largest option found. The program listing for this routine is as follows:

```
22180   REM  ACCEPT A CHAIN NAME
22185   REM
22190   Z = VAL ( MID$ (A$,2,2)) : REM  GET THE OPTION NUMBER
22195   IF ITEM% < Z THEN ITEM% = Z: REM  ADJUST COUNTER
22200   LINE$(Z) = MID$ (A$,4)    : REM  MOVE THE FILE NAME
22205   ROW% = ROW% + 1           : REM  INCREMENT COUNTER
22210   RETURN
22215   REM
22220   REM  *********************************
22225   REM
```

Modifications to the Help Screen Display Routine

Two lines must be added to the existing help screen display routine from Chapter 4 to enable it to process menus. They are as follows:

```
21237   IF ROW% = LINE% THEN PRINT DSK$;"CLOSE ";HELP$: RETURN :
          REM  21237 ALL DONE
21242   IF MID$ (A$,1,1) = "#" THEN GOSUB 22180: GOTO 21237 :
          REM  21242 PROCESS MENU FILE NAMES
```

Using the Help Subroutine

The menu system employs the help routine for user on-line help in the same way that the data entry system does. If the user enters ^Q, then on line 22135 the text

```
" HELP"
```

is added to the end of the menu screen name, SCREEN$. Since the help system is a fundamental part of the menu system, you should use it.

SAMPLE MENU SCREEN

Figure 6.2 illustrates one method of entering a menu. This menu is designed to chain to other programs or terminate execution and return to BASIC. Note that both the title and the number 0 will be highlighted since they have been enclosed within ^ symbols.

FIG. 6.2 Sample menu screen saved as CHAP6 MENU

```
                    ^ACCOUNTING MASTER MENU^

                PLEASE SELECT OPTION -

                1. ACCOUNTS RECEIVABLE PROCESSING

#01 AR MENU#

                2. PAYROLL PREPARATION

#02 PAYROLL MENU#

                3. GENERAL LEDGER TRANSACTIONS AND REPORTS

#03 GL MENU#

                4. INVENTORY MAINTENANCE

#04 INV MENU#

                5. ACCOUNTS PAYABLE PROCESSING

#05 AP MENU#

                ^0^. ESC - EXIT TO BASIC

#00 END#
```

TEST POINT

First, create a menu to chain onto some programs you previously created or the programs developed in the earlier chapters (which is what is done on the optionally available floppy). Run the program and make sure that the screen is displayed properly and that the correct program is chained.

Second, change lines 22160 and 22165 presented earlier to branch to some small subroutine that you create. These subroutines can do something clever, like clear the screen and print "option 1," etc. After the subroutine executes, the menu should be redisplayed.

Enter these lines for testing:

```
100   REM  TEST ROUTINE FOR MENU DRIVER
110   REM
120   REM
130   DIM LINE$(10)
140   SCREEN$ = "CHAP6 MENU"
150   GOTO 22000: REM  DISPLAY THE MENU AND CHAIN
160   END
```

USER INSTRUCTIONS

The following subsections contain the user instructions for the menu system. Please add these instructions to your user's manual.

Using a Menu

A *menu* is a list of actions that the computer can perform. After reading the available options, select the one you want by entering its number followed by a carriage return. For example, if you were looking at the following screen and you wished to run the general ledger program, you would enter 3 (CR).

```
            ACCOUNTING MASTER MENU

PLEASE SELECT OPTION -

1. ACCOUNTS RECEIVABLE PROCESSING
```

```
2. PAYROLL PREPARATION

3. GENERAL LEDGER TRANSACTIONS AND REPORTS

4. INVENTORY MAINTENANCE

5. ACCOUNTS PAYABLE PROCESSING

0. ESC - RETURN TO PREVIOUS MENU
```

Requesting Help

If you cannot decide which option to select or you do not understand what is wanted from you, help can be requested by entering a ^Q (control Q) in response to PLEASE SELECT OPTION. The help text contains a detailed explanation of what each option will do. After the help text has been displayed, the menu will be redisplayed.

Exiting, or Which Way Is Out?

To return to the previous menu and eventually back to BASIC, either enter 0 (CR) or simply strike the ESC (escape) key. [*Note*: The default option is 0; therefore striking the RETURN key is the same as entering 0 (CR).]

COMPLETE MENU PROGRAM

The complete listing of the menu program is as follows:

```
?????   DIM LINE$(10)  (NOTE: DON'T FORGET TO INCLUDE THIS DIMENSION
                               STATEMENT AT THE FRONT OF YOUR
                               PROGRAM IF IT IS NOT INCLUDED IN
                               ANOTHER ROUTINE)
```

```
21237     IF ROW% = LINE% THEN PRINT DSK$;"CLOSE ";HELP$: RETURN :
            REM  21237 ALL DONE
21242     IF MID$ (A$,1,1) = "#" THEN GOSUB 22180: GOTO 21237 :
            REM  21242 PROCESS MENU FILE NAMES

100       REM  TEST ROUTINE FOR MENU DRIVER
110       REM
120       REM
130       DIM LINE$(10)
140       SCREEN$ = "CHAP6 MENU"
150       GOTO 22000: REM  DISPLAY THE MENU AND CHAIN
160       END

22000     REM  MENU DRIVER *
22005     REM
22010     REM
22015     REM
22020     REM  DISPLAYS MENU AND CHAINS TO PROGRAM OF USERS CHOICE
22025     REM
22030     REM
22035     REM  IMPORTANT VARIABLES USED:
22040     REM  LINE$() CONTAINS NAME OF PROGRAM TO CHAIN TO
22045     REM
22050     DSK$ = CHR$ (4)           : REM  DISK ^D
22055     ITEMS% = 0                : REM  NUMBER OF OPTIONS
22060     NOPAUSE% = 1              : REM  INFORM HELP SYSTEM NOT TO PAUSE
22065     HELP$ = SCREEN$           : REM  SEND THE MENU NAME
22070     GOSUB 21000               : REM  SHOW THE SCREEN USING HELP ROUTINE
22075     NOPAUSE% = 0              : REM  RESTORE THE FLAG FOR OTHERS
22080     REM
22085     REM  ASK FOR OPTION
22090     REM
22095     VTAB 3
22100     POKE 36, 10               : REM  HTAB
22105     PRINT "PLEASE SELECT OPTION"
22110     ROW% = 3
22115     COL% = 35
22120     MASK$ = "##"              : REM  ALLOW HELP REQUEST
22125     ENTRY$ = "0"
22130     GOSUB 50000               : REM  ACCEPT OPTION
```

```
22135  IF HELP% THEN HELP$ = SCREEN$ + " HELP": GOSUB 21000 :
         GOTO 22000: REM  RESPONDED TO HELP REQUEST
22140  X = VAL (ENTRY$)          : REM  OPTION SELECTED
22145  IF X > ITEMS% THEN GOTO 22000: REM  BAD ENTRY
22150  IF LINE$(X) = "END" THEN HOME : END : REM  RETURN TO BASIC
22152  IF LINE$(X) = "HELP" THEN HELP% = 1:HELP$ = SCREEN$ + " HELP": GOSUB
         21000: GOTO 22000: REM  RESPONDED TO HELP REQUEST
22155  PRINT                     : REM  CLEAR FOR DISK COMMAND
22160  PRINT DSK$;"RUN ";LINE$(X): REM  CHAIN TO THE REQUESTED PROGRAM
22165  REM
22170  REM  *********************************
22175  REM
22180  REM  ACCEPT A CHAIN NAME
22185  REM
22190  Z = VAL ( MID$ (A$,2,2)) : REM  GET THE OPTION NUMBER
22195  IF ITEM% < Z THEN ITEM% = Z: REM  ADJUST COUNTER
22200  LINE$(Z) = MID$ (A$,4)    : REM  MOVE THE FILE NAME
22205  ROW% = ROW% + 1           : REM  INCREMENT COUNTER
22210  RETURN
22215  REM
22220  REM  *******************************
22225  REM
```

CHAPTER 7

REPORT GENERATION

INTRODUCTION

Generating reports is a time-consuming programming task. Creating a dump of the data is not time-consuming; creating polished and meaningful reports is what takes the time. This chapter deals with the problem of report generation. First, we discuss some philosophical aspects of report creation, making some suggestions. Then we present and explain a program designed to make the task of actually creating a report easier for you, the programmer.

PHILOSOPHICAL CONSIDERATIONS

We have all heard it said many times that "data goes into the machine; information comes out." A report containing raw data is usually of little value, unless the only purpose of the report is to record all data, as in a scientific experiment notebook. But a programmer typically is trying to change data into information, and this process can be broken into some definite steps of action. We will describe these steps, giving an example and our recommendations, in the following subsections.

Steps in Report Generation

The first thing to do is to consider what information is to be presented and what data this information is generated from. How much of the data is needed to support the information directly? How much can be left out or output in a separate report (produced only when required) to be used to verify the accuracy of data entry or collection?

Second, consider who the report is for. Is it for the vice-president of marketing, the engineering staff, the secretarial pool, or the maintenance team? Even though they are using the same data/information, these users may have individual requirements and formats. Also, each group looks at the data from a different perspective.

Third, consider how the report is going to be used. Several different presentations of the same data/information may be required.

An Example

To illustrate what we mean, we'll look at a very common example that most of us come into contact with at one time or another: the quarterly stockholder's report for a corporation. It comes out in one style and one format for everyone. Whether or not you understand it, that's how you get it. It is usually dressed up on slick printing stock with many color photographs. This trick is known as camouflage—no one reads the numbers anyway, right? If the data were really important, we suspect, it would not be presented only in standard CPA jargon and format. However, the information could be presented in several formats within the

same report so that the stockholders would have a clear understanding of the company's financial condition and changes without having to learn how to decipher the data.

In an improved reporting format the standard balance sheet and profit/loss statement could be supplied in the report for reference and for those who prefer to read them in their formal format. For the rest of us the key points could be called out and explained as follows:

1. Our new warehouse in Irvine is now open and has been fully stocked with 1,000,000 Widgets, raising our inventory value by $Z and the overhead by $T.
2. A 1000-acre plot surrounding our Silicon Valley plant has been sold, reducing the value of our physical assets by $X and increasing our cash holdings by $Y.
3. The 10,000,000 model 1963 Widgets stored in Alaska have been donated to the local junior college, giving us a tax credit of $C and an inventory write-off of $D, and freeing 60,000 square feet of needed warehouse space.

This type of disclosure tells the stockholders what has transpired. In fact, it may tell them too much. For this reason you must consider the three points listed previously and zero in on your target reader when you write your report. The corporations may have decided that they will present their reports only one way because of the huge and varied audience they address. You, on the other hand, have a smaller audience for your reports, and hence you can be more specific in what you report and how you present it.

Recommendations

So, if designing a good report requires addressing the three points, which focus on user requirements, it follows that you should talk to the potential users and survey their needs. Their responses will vary from "We do not have any idea" or "We do not care" to very specific and well-thought-out requirements. Since these reports are for users, their requirements should receive your thoughtful attention. For those of you unfortunate

enough to get the "no help" answers, try to consider the user's viewpoint. Then try to visualize the finished product, and create a sample report. Once you provide the users with a sample, they unfailingly have no problem coming up with criticisms (they will call them suggestions).

Actually, trying to make all users happy is an impossible task, and some political skills will be required. For instance, you may want to remind (inform, educate) the users that the computer does not do the organization or report preparation. *You* must design it for the computer, and the user's cooperation is necessary and appreciated.

SIMPLE REPORT GENERATOR

Getting information into the computer is usually easier than getting it out, because you may take a single page of input data and create twenty pages of output information. Designing and programming twenty pages of output is a lot of work. The program presented in this chapter will be helpful for outputting many types of reports. (However, it may be totally worthless for others.)

The report generator is based on a concept similar to that used for the data entry screen. The text file contains both the regular text to appear on the page and information describing the variable and its position on the printed page. In cases where data is being extracted from a file and listed one line at a time down the page, a simple loop may still be the best way to create the report.

Design

As in the data entry screen, the report generator uses an array of variables. This situation is a simple one and will generally only be useful on pages containing a small amount of information. You can improve on this technique by adding additional markers to represent special or recurring variables in your report. For example, you might use markers for general ledger account numbers or inventory part numbers.

Building the Program

The program presented in this chapter does not use any of the subroutines from the previous chapters. The easiest way to enter the program is to use the screen editor from Chapter 3 (which creates a T, or text, file) and then EXEC the file into memory, creating an A, or Applesoft, file to be saved to disk—and be sure to use a new name!

The output to the printer portion of the program may require special commands to be passed depending on the type of printer used. One of the most popular makes, the Epson, requires the code CONTROL I 80 N to be sent to the printer to initialize it before printing more than 40 columns (as many other printers require). The "80" can be any number between 1 and 255 or the limit of the printer, whichever is smaller. The most common value used is 80. Many special features such as different character fonts and bold printing are possible. See your printer manual for the special codes it requires.

Programmer Features

With our program we want the programmer to be able to create and modify a report layout without having to modify the BASIC program used to create the report. The text editor from Chapter 3 can be used to create and edit the report. In the text file describing the report the number of the array element to be printed is placed between < and > symbols. For example, <23> means "print array element 23 at this location." Also, the & symbol at the end of the line is used to indicate that two or more lines are to be concatenated before printing.

There are two possible ways of inserting information into an existing line of text: expand the line to fit new data or truncate the data to fit existing space. If the information to be inserted into the line is too long or too short to fill the space between the < and > symbols, the line is adjusted so that the data fits exactly the space described.

A simple code is used to tell the report generator which method is desired. If a space is included between the symbols, then a short line will be filled with spaces and not expanded. For example, suppose we wish to insert "Marty and Alan" into these lines:

```
<1> are two great guys who write strange books.

<1  > are two great guys who write strange books.

<1                          > 100    200    3000    100
```

These lines become

```
Marty and Alan are two great guys who write strange books.

Marty are two great guys who write strange books.

Marty and Alan                 100    200    3000    100
```

The first example contains no spaces between the < and > symbols. Therefore the line is expanded to accept the entire insert without extra spaces.

The second example has the two < and > symbols, the array reference number (one digit or space), and two spaces, totaling five spaces for the mask. Therefore, the report generator only accepts the first five characters of the insert.

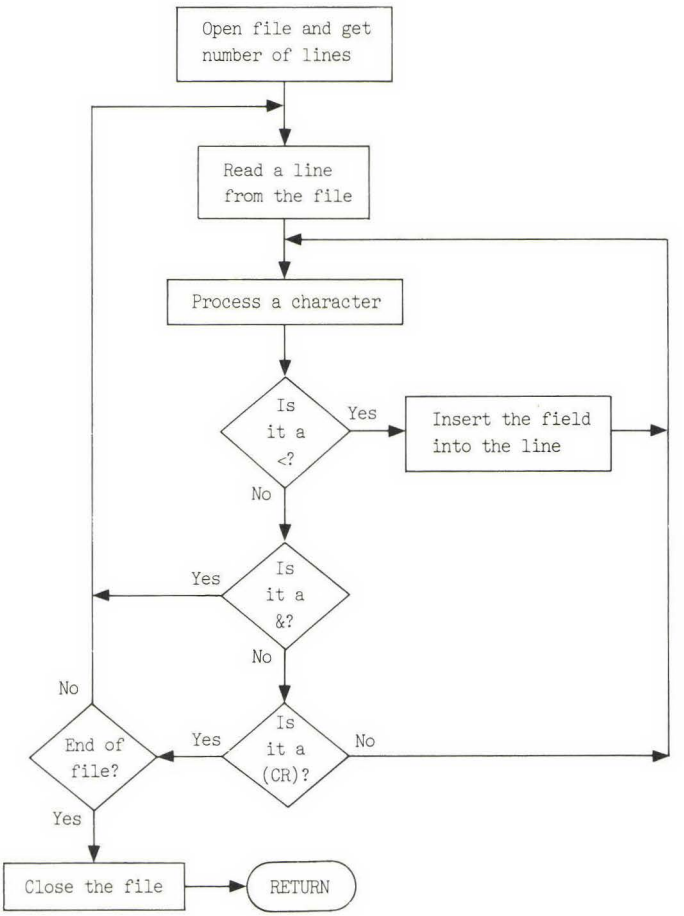
The third example has a mask size in excess of the size of the insert. Thus the report generator prints the entire insert along with the remaining spaces to complete the mask.

As these examples show, if you want the entire insert and aren't sure how long it is going to be, either leave no spaces or far too many.

PROGRAM FEATURES

The flowchart for the report generator is shown in Fig. 7.1. After the text file describing the report page is opened and the length of the file is read, the file is processed one line at a time. Each line is processed one character at a time, looking for a < symbol. If the character is not a <, then it is printed. Once a < is encountered, the array element number is determined and the decision is made about whether or not the line is to be expanded. Then the data is printed.

FIG. 7.1 Flowchart for report generator



We have included a couple of other variations in the program, which is listed at the end of the chapter. First, we have included lines that cause a single page to be selected from a group of pages (lines 30025 and 30065). If you have only one page, you will not need this option.

The second option allows you to print the report either to the disk or directly to a printer by setting DEVICE%. If DEVICE% equals 0, you will

print to the disk; otherwise, the report will be sent to a printer port. Why would you want to send the report to the disk? Convenience is the main reason. A report can be created and stored on the disk much faster than the average printer can print. Therefore, the operator can use the computer again sooner, and the report can be printed later, perhaps at a more convenient time. If a large number of reports are being created and user input is required in between each report, a lot of time can be wasted waiting for the printer to finish.

Explanation of Variables

The report subroutine requires two arrays to be dimensioned, PAGE$( ) and LINE$( ). PAGE$( ) contains the names of the report pages to be printed and should be dimensioned to at least the maximum number of report definition pages required. LINE$( ) contains the actual data to be printed. It must be dimensioned to at least the maximum number of data points used.

Report Generator Test Program

The report generator can be tested with the following routines:

```
100     REM  TEST ROUTINE FOR DATA PRINT
110     REM
120     DEVICE% = 1                        : REM  FOR PRINTER IN SLOT #1
130     DIM LINE$(10)
140     DIM PAGE$(10)
150     PAGE$(1) = "CHAP7A RPT"            : REM  NAME OF REPORT
160     PAGE$(2) = "CHAP7B RPT"            : REM  YOU PROVIDE THIS PAGE
170     PAGE% = 1                          : REM  TRY THE FIRST PAGE
180     GOSUB 30000                        : REM  PRINT A PAGE
190     PRINT
200     PRINT "DONE"; CHR$ (7)             : REM  RING THE BELL
210     PRINT
220     END
230     REM
240     REM
250     REM
```

FIG. 7.2 Sample report

MASK

```
NAME        <1>

STREET      <2>

ZIP CODE    <3>

AMOUNT      <4>


<1> LIVE AT <2> AND OWES & US $ <4>
```

OUTPUT

```
NAME        JOHN JONES

STREET      1234 FIRST STREET

ZIP CODE    1000

AMOUNT      3000


JOHN JONES LIVES AT 1234 FIRST STREET AND OWES US $ 3000
```

```
35000   REM  DATA FOR TEST (CHAP7A RPT)
35010   REM
35020   LINE$(1) = "JOHN JONES"
35030   LINE$(2) = "1234 FIRST STREET"
35040   X = 1000
35050   LINE$(3) = STR$ (X)
35060   LINE$(4) = STR$ (X * 3)
35070   RETURN
35080   REM  ********************
35090   REM
35100   REM
```

The first routine is the calling or "main" program. Lines 150 and 160 name two report pages assigned to the array PAGE$( ). The second routine sets up the LINE$( ) array for printing. In this program the values of the array are assigned directly. In your programs you will usually use variables.

The first report, CHAP7A RPT, is shown in Fig. 7.2. The second report and the data assignment subroutine (line 35000) are left as exercises for you to do.

Since there is only one report page, PAGE% on line 170 is set equal to 1. If you add a second report, this line can be replaced with

```
170   INPUT "ENTER PAGE NUMBER: "PAGE%
```

COMPLETE REPORT GENERATOR PROGRAM

Here is the listing for the report generator program:

```
100     REM  TEST ROUTINE FOR DATA PRINT
110     REM
120     DEVICE% = 1                        : REM  FOR PRINTER IN SLOT #1
130     DIM LINE$(10)
140     DIM PAGE$(10)
150     PAGE$(1) = "CHAP7A RPT"            : REM  NAME OF REPORT
160     PAGE$(2) = "CHAP7B RPT"            : REM  YOU PROVIDE THIS PAGE
170     PAGE% = 1                          : REM  TRY THE FIRST PAGE
180     GOSUB 30000                        : REM  PRINT A PAGE
190     PRINT
200     PRINT "DONE"; CHR$ (7)             : REM  RING THE BELL
210     PRINT
220     END
230     REM
240     REM
250     REM

30000   REM  DATA PRINT SUBROUTINE
30005   REM
30010   REM  THIS FILLS IN A DATA PAGE AND SENDS IT TO THE PRINTER OR DISK
```

```
30015  REM
30020  REM  BE SURE TO ADD SPECIAL PRINTER COMMANDS
30025  SCREEN$ = PAGE$(PAGE%)     : REM  THE PAGE TO FILL
30030  HOME                       : REM  INFORM THE USER OF PRINTING
30035  VTAB 10
30040  POKE 36, 10                : REM  HTAB
30045  PRINT "PROCESSING ";SCREEN$
30050  VTAB 12
30055  POKE 36, 15                : REM  HTAB
30060  PRINT "PLEASE WAIT"
30065  ON PAGE% GOSUB 35000,35500: REM  FILL LINE$() WITH VALUES
30070  DSK$ = CHR$ (4)            : REM  DISK COMMAND CODE
30075  PRINT DSK$;"OPEN ";SCREEN$: REM  OPEN THE PAGE FOR INPUT
30080  IF DEVICE% < > 0 THEN PRINT DSK$;"PR#";DEVICE%: GOTO 30115: REM
         SEND DIRECTLY TO THE PRINTER
30085  REM
30090  REM  PRINT IT TO A DISK FILE
30095  REM
30100  PRINT DSK$;"OPEN ";SCREEN$;" REPORT"
30105  PRINT DSK$;"DELETE ";SCREEN$;" REPORT": REM  ERASE ANY OLD FILE
30110  PRINT DSK$;"OPEN ";SCREEN$;" REPORT": REM  OPEN A CLEAN NEW FILE
30115  PRINT DSK$;"READ ";SCREEN$: REM  GET THE NUMBER OF LINES
30120  INPUT ITEMS%
30125  REM
30130  REM
30135  ITEMS% = ITEMS% - 1        : REM  DECREMENT COUNTER
30140  IF ITEMS% < 0 THEN GOTO 30475: REM   ALL DONE SO EXIT
30145  PRINT DSK$;"READ ";SCREEN$: REM  READ THE DATA PAGE
30150  INPUT ENTRY$               : REM  GET A LINE FROM THE DATA PAGE
30155  IF A$ < > "&" THEN C$ = "": REM  CLEAR THE OUTPUT LINE
30160  IF A$ = "&" THEN GOSUB 30240: REM  STRIP LEADING SPACES
30165  REM
30170  REM  PROCESS ENTRY$ ONE CHAR AT A TIME LOOKING FOR INSERTS
30175  REM
30180  FOR X = 1 TO LEN (ENTRY$) : REM  STEP DOWN THE LINE
30185  A$ = MID$ (ENTRY$,X,1)     : REM  GET ONE CHARACTER
30190  IF A$ = "<" THEN GOSUB 30275: GOTO 30205: REM  DO AN INSERTION
30195  IF A$ = "&" THEN X = LEN (ENTRY$): GOTO 30205: REM  CONTINUATION
         SYMBOL
30200  C$ = C$ + A$               : REM  BUILD THE OUTPUT STRING
30205  NEXT X
```

```
30210   IF DEVICE% = 0 THEN PRINT DSK$;"WRITE ";SCREEN$;" REPORT": REM
          SEND OUTPUT TO DISK
30215   IF A$ < > "&" THEN PRINT C$: REM  OUTPUT THE STRING
30220   GOTO 30135
30225   REM  *******************************
30230   REM
30235   REM
30240   REM  REMOVE THE LEADING SPACES
30245   REM
30250   IF MID$ (ENTRY$,1,1) = " " THEN ENTRY$ = MID$ (ENTRY$,2):
          GOTO 30250: REM  FOUND ONE SO REMOVE IT
30255   RETURN
30260   REM  *******************************
30265   REM
30270   REM
30275   REM  INSERT A FIELD INTO THE LINE
30280   REM
30285   REM  TWO MODES:
30290   REM 1) INSERT AND CONCATENATE
30295   REM 2) INSERT BUT DO NOT CONCATENATE
30300   REM MODE 1 IS USED WHEN NO SPACES EXIST BETWEEN <> SYMBOLS
30305   REM MODE 2 IS USED IF A SPACE EXISTS BETWEEN <> SYMBOLS
30310   REM
30315   REM
30320   REM
30325   REM
30330   REM  FIRST REMOVE THE <> SYMBOLS
30335   REM
30340   Y = 0                       : REM  DEFAULT TO MODE 1
30345   X = X + 1
30350   IF X > LEN (ENTRY$) THEN A$ = "": RETURN : REM
          ONLY ONE SYMBOL SO ERROR
30355   B$ = MID$ (ENTRY$,X,1)     : REM  GET ONE CHARACTER
30360   A$ = A$ + B$
30365   IF B$ < > ">" THEN GOTO 30345: REM  NOT DONE SO GET ANOTHER CHARACTER
30370   REM  LOOK FOR A SPACE TO SET MODE
30375   FOR Z = 1 TO LEN (A$)
30380   IF A$ = " " THEN Y = Z:Z = LEN (A$)
30385   NEXT Z
30390   IF Y = 0 THEN Z = VAL ( MID$ (A$,2, LEN (A$) - 1))
30395   IF Y < > 0 THEN Z = VAL (MID$ (A$,2,Y - 1)): REM  GET THE FIELD NUMBER
```

```
30400   C$ = C$ + LINE$(Z)          : REM  ADD THE FIELD
30405   IF Y = 0 THEN A$ = "": RETURN  : REM  MODE 1 SO ALL DONE
30410   REM
30415   REM  MODE 2 SELECTED SO WE MUST FILL WITH SPACES
30420   REM
30425   IF LEN (LINE$(Z) = LEN (A$) THEN RETURN : REM  NOTHING TO CLEAR
30430   Y = LEN (A$) - LEN (LINE$(Z))
30435   FOR Z = 1 TO Y
30440   C$ = C$ + " "               : REM  ADD THE SPACES
30445   NEXT Z
30450   A$ = ""
30455   RETURN                      : REM  ALL DONE
30460   REM  *********************************
30465   REM
30470   REM
30475   REM  CLOSE EVERYTHING AND RETURN
30480   REM
30485   PRINT DSK$;"CLOSE ";SCREEN$
30490   IF DEVICE% = 0 THEN PRINT DSK$;"CLOSE ";SCREEN$;" REPORT"
30495   IF DEVICE% < > 0 THEN PRINT DSK$;"PR#0": REM  RETURN TO
          SCREEN OUTPUT
30500   HOME                        : REM  CLEAR THE SCREEN
30505   RETURN
30510   REM  ***********************************
30515   REM
30520   REM

35000   REM  DATA FOR TEST (CHAP7A RPT)
35010   REM
35020   LINE$(1) = "JOHN JONES"
35030   LINE$(2) = "1234 FIRST STREET"
35040   X = 1000
35050   LINE$(3) = STR$ (X)
35060   LINE$(4) = STR$ (X * 3)
35070   RETURN
35080   REM  ********************
35090   REM
35100   REM
```

PERSONAL CALENDAR: A SAMPLE PROGRAM

INTRODUCTION

Thus far, several flexible subroutines have been developed. This chapter will illustrate how easy it is to use these subroutines to create larger programs. The sample program developed in this chapter will maintain a personal appointment calendar. This program is a moderate-sized program, but it is easily and quickly constructed by using the building blocks developed in the previous chapters. We will use the same methods to create the personal calendar program that we used in the previous chapters.

In addition to using the routines developed in the previous chapters, the personal calendar program introduces a few new routines and concepts. A subroutine is used to calculate the number of days a given date is

from the beginning of the year. Another subroutine uses a random-access file to store the appointment information.

In the following subsections we design the input screens and the reports. Then in succeeding sections we create the various program modules necessary to connect everything together.

Building the Program

The calendar program builds on the routines that have been developed in previous chapters. The routines of this chapter can be combined with those of Chapters 2, 4, 5, 6, and 7 by the EXEC technique described in Chapter 3.

Here is the method to use to build the calendar program:

1. Start with a fresh, initialized disk for the program of this chapter.
2. Transfer copies of the programs developed in Chapters 2, 4, 5, 6, and 7 to your new disk (A, or Applesoft, copies), using DOS. Merge them and save the results under the name CAL.A.
3. Using the screen editor from Chapter 3, type in the program lines presented in this chapter and save them (these lines will be T, or text, files) under the name CAL.T.
4. Using DOS, load CAL.A into memory and EXEC the file of this chapter (CAL.T), or as much of it as you have entered so far, into memory. Now the two programs are merged and can be saved again on disk as Applesoft files, ready to run the next time you load them.
5. Repeat steps 3 and 4 each time you enter more of the program from this chapter.

Design

The personal calendar program displays, accepts, and prints hourly appointment information. The features of this program can best be seen by looking at the various input screens and reports.

The menu, shown in Fig. 8.1, lists the available options: (1) review, (2) print, (3) help, and (4) exit. If options 1 and 2 are selected, then the pro-

FIG. 8.1 Appointment calendar menu

```
   ^APPOINTMENT CALENDAR MENU^


1.  REVIEW DAY'S APPOINTMENTS

2.  PRINT ONE DAY'S APPOINTMENTS

3.  PRINT GROUP OF DAYS

4.  ^HELP^

^0.  EXIT TO BASIC^
```

gram will ask for the date to be reviewed or printed, as shown in Fig. 8.2. If option 3 is selected, then the range of dates of interest is entered, as illustrated in Fig. 8.3.

The appointment data entry screen is shown in Fig. 8.4. It is designed to accept hourly appointments between 8 A.M. and 5 P.M. The report generator template, shown in Fig. 8.5, is very similar to the data entry screen.

Since any date may be edited, random-access files are used to store the data on the disk.

FIG. 8.2 Single date entry screen

```
          ^APPOINTMENT DATE^


1.  MONTH OF APPOINTMENT          <##>

2.  DAY OF MONTH                  <##>
```

FIG. 8.3 Data entry screen for group of dates

```
                ^APPOINTMENT CALENDAR^

1.  BEGINNING MONTH                 <##>

2.  DAY OF BEGINNING MONTH          <##>

3.  LAST MONTH                      <##>

4.  DAY OF LAST MONTH               <##>
```

FIG. 8.4 Data entry screen for appointments

```
              ^APPOINTMENT CALENDAR^

 1.  8 AM <AAAAAAAAAAAAAAAAAAAAAAAAA>

 2.  9 AM <AAAAAAAAAAAAAAAAAAAAAAAAA>

 3.  10 AM <AAAAAAAAAAAAAAAAAAAAAAAAA>

 4.  11 AM <AAAAAAAAAAAAAAAAAAAAAAAAA>

 5.  12 PM <AAAAAAAAAAAAAAAAAAAAAAAAA>

 6.  1 PM <AAAAAAAAAAAAAAAAAAAAAAAAA>

 7.  2 PM <AAAAAAAAAAAAAAAAAAAAAAAAA>

 8.  3 PM <AAAAAAAAAAAAAAAAAAAAAAAAA>

 9.  4 PM <AAAAAAAAAAAAAAAAAAAAAAAAA>

10.  5 PM <AAAAAAAAAAAAAAAAAAAAAAAAA>
```

FIG. 8.5 Appointment report generator template

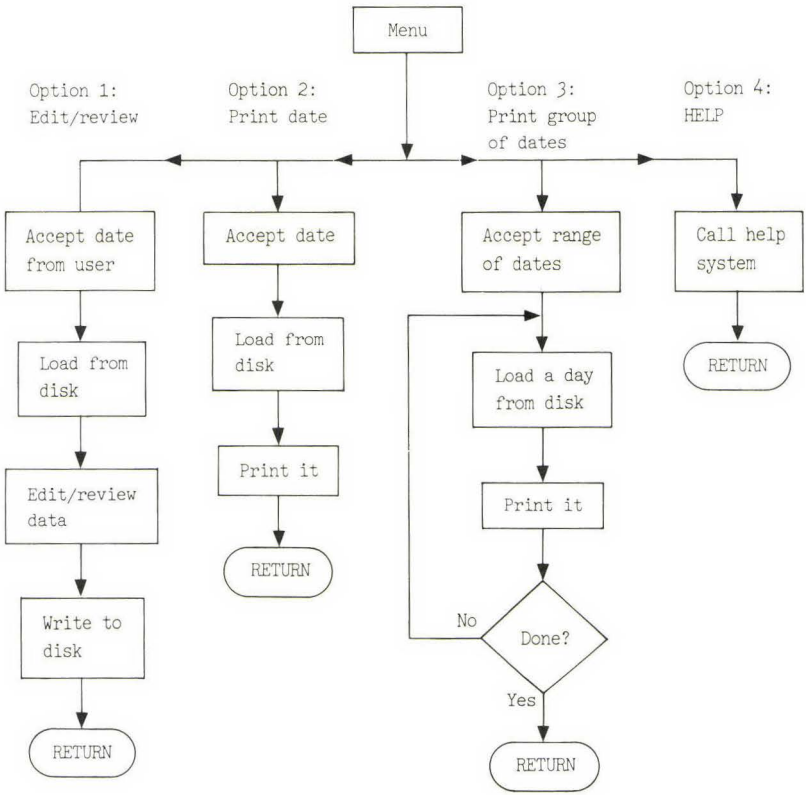
```
        ^APPOINTMENT CALENDAR^

 8 AM <1>

 9 AM <2>

10 AM <3>

11 AM <4>

12 PM <5>

 1 PM <6>

 2 PM <7>

 3 PM <8>

 4 PM <9>

 5 PM <10>
```

BASIC CALENDAR PROGRAM

The calendar program, flowcharted in Fig. 8.6, uses the following subroutines:

- Menu,
- Accept single date,
- Load data from disk,
- Edit/review appointment data,
- Write data to disk,
- Print data,
- User help text.

FIG. 8.6



Most of these routines are based on subroutines developed in the previous chapters.

In the following subsections the personal calendar program will be created one menu option at a time, beginning with the menu itself. Before you begin editing the program, however, you should merge the subroutines from Chapters 2, 4, 5, 6, and 7.

Menu

The menu uses the menu system from Chapter 6 to display the options, accept an option, and branch to the requested routine. This program could be considered the master or main program because it calls the other routines.

```
100     REM
110     REM  CHAPTER 8 PERSONAL CALENDAR
120     REM
130     REM
140     REM
150     REM  THIS MAINTAINS AN ANNUAL PERSONAL CALENDAR. IT IS
160     REM  AN EXAMPLE OF HOW A LARGE PROGRAM CAN BE BUILT
170     REM  FROM THE SUBROUTINES DEVELOPED THROUGHOUT THE BOOK.
180     REM
190     REM
200     LAST% = 10      : REM  NUMBER OF FIELDS ON THE DATA ENTRY SCREEN
210     DIM LINE$(LAST%): REM  THESE ARE FOR DATA ENTRY ROUTINE
220     DIM SROW%(LAST%)
230     DIM SCOL%(LAST%)
240     DIM SMASK%(LAST%)
250     REM
260     REM  CALL THE MENU ROUTINE
270     REM
280     DSK$ = CHR$(4)              : REM  ^D
290     DEVICE% = 1                 : REM  PRINTER SLOT NUMBER
300     PRINT DSK$;"OPEN CALENDAR,L280"  : REM  OPEN THE CALENDAR FILE
310     PRINT
320     SCREEN$ = "CHAP8 MENU"          : REM  NAME OF MENU SCREEN
330     REM  THE MENU ROUTINE WILL BRANCH TO THE APPROPRIATE ROUTINE
340     REM  AND RETURN HERE OR IT WILL END
350     REM
360     GOSUB 22000                 : REM  THE MENU ROUTINE
370     GOTO 320                    : REM  TRY AGAIN
380     REM
390     REM
400     REM
```

In addition to using the above program, you must change some lines in the original menu subroutine. Line 22145 must be deleted. Lines 22150 and 22165 must be changed to

```
22150   IF X = 0 THEN HOME : END : REM RETURN TO BASIC
22165   RETURN
```

Also, instead of chaining to another program, you change line 22160 to a branch,

```
22160 ON X GOSUB 1000,2000,3000,4000
```

where the subroutines perform as follows:

1000 edit/reviews a day's appointments,
2000 prints a single day's appointments,
3000 prints a group of dates,
4000 provides user help text.

The help text is shown later in this chapter (in the "Option 4: Help" subsection) and is saved on the disk as CHAP8 MENU HELP.

TEST POINT

When you execute the program, it should display the menu of Fig. 8.1. The only option, (0), should be working. Verify that it does clear the screen, and stop the program.

Option 1: Edit/Review a Day's Appointments

Option 1 combines two features: editing and reviewing the data. In some programs you may want to separate these features. For example, you may have several people using a program and you may not want all of them to be able to edit the data. If you are not concerned about keeping

people from editing, then we feel it is more convenient to keep both features combined. Since this program is a personal calendar program, anyone who has access to the calendar can change it.

The program for option 1, shown below, is quite simple:

```
1000    REM  OPTION 1 EDIT/REVIEW ONE DATE
1010    REM
1020    GOSUB 7000                  : REM  ACCEPT THE DATE
1030    GOSUB 8000                  : REM  LOAD FROM DISK
1040    SCREEN$(1) = "CHAP8 ENTRY" : REM  DATA SCREEN NAME
1050    PAGE% = 1                   : REM  USE THE FIRST PAGE
1060    GOSUB 20000                 : REM  EDIT THE DATA
1070    GOSUB 9000                  : REM  WRITE TO DISK
1080    RETURN
1090    REM
1100    REM  ******************************
1110    REM
```

Subroutines 7000, 8000, and 9000 are described in succeeding sections. Subroutine 20000 is the data entry system from Chapter 5.

Additionally, a data entry screen, shown in Fig. 8.4, and the help text, Fig. 8.7, must be entered.

Accepting a Date

Two functions are performed by subroutine 7000: It accepts a month and day from the user, and then it calculates the number of days this date is from the beginning of the year.

The number of days between any two dates can be found by calculating a value for both dates, using the following formulas, and then subtracting these values (subroutine 7500). The formula for dates in January and February is

$$\text{value} = 365(\text{year}) + \text{day} + 31(\text{month} - 1) + \text{INT}[(\text{year} - 1)/4] - \text{INT}\{.75\{\text{INT}[(\text{year} - 1)/100] + 1\}\}.$$

For dates between March and December the formula is

$$\text{value} = 365(\text{year}) + \text{day} + 31(\text{month} - 1) + \text{INT}[(\text{year} - 1)/4] - \text{INT}[.75\{\text{INT}[(\text{year} - 1)/100] + 1\}) - \text{INT}[.4(\text{month}) + 2.3].$$

The terms in the above equations have the following meanings:

- Year is the calendar year (e.g., 1983).
- Month is the number of the month (e.g., March is 3).
- Day is the number of the day's date (e.g., 31).
- INT is the BASIC integer command.

INT The INT(N) command returns the integer (whole number) part of the argument N.

EXAMPLE

```
100  X = 100.25
110  PRINT "INTEGER ";INT(X)
```

When this program is executed, the computer will print

```
INTEGER 100
```

The program listing for the subroutine that accepts a date is as follows:

```
7000    REM
7010    REM  ACCEPT A DATE
7020    REM
7030    REM
7040    PAGE% = 2                        : REM  ASSIGN TO DATA PAGE 2
7050    SCREEN$(PAGE%) = "CHAP8 DATE": REM  DATA SCREEN NAME
7060    GOSUB 20000                      : REM  DATA ENTRY ROUTINE
7070    GOSUB 7500                       : REM  CALCULATE DAY NUMBER
7080    RETURN
7090    REM
7100    REM
7110    REM
7500    REM  CALCULATE DAY NUMBER
```

```
7510    YY = 1983              : REM  CURRENT YEAR
7520    IF (MM = 0) OR (DD = 0) THEN DAY = 1:RETURN: REM  ERROR SO FORCE 1
7530    IF (MM > 12) OR (DD > 31) THEN DAY = 1:RETURN: REM  BAD DATE ENTERED
7540    JAN1 = 365 * YY + INT((YY - 1) / 4) - INT(.75 * (INT((YY - 1) / 100)
          + 1)) : REM  VALUE FOR JAN 1, YY
7550    IF MM > 3 THEN GOTO 7590    : REM  USE SECOND EQUATION
7560    DAY = 365 * YY + DD + 31 * ( MM - 1) + INT (( YY - 1) / 4) - INT
          ( .75 * ( INT (( YY - 1 / 100) + 1)) - JAN1: REM  DAYS FROM JAN1
7570    RETURN
7580    REM
7590    REM  NOW FOR MARCH THRU DECEMBER
7600    REM
7610    DAY = 365 * YY + DD + 31 * (MM - 1) + INT (YY / 4) - INT (.75 * (
          INT ( YY / 100) + 1)) - INT (.4 * MM + 2.3) - JAN1: REM  FOR
          MARCH THRU DECEMBER
7620    RETURN
7630    REM
7640    REM  ***************
7650    REM
```

The data entry routine of Chapter 5 (line 7060, GOSUB 20000) calls routine 26000 (shown below) to fill the LINE$( ) array with the original or default values and routine 26500 (below) to move LINE$( ) values into the regular variable names. There are no default values in this routine, so routine 26000 merely clears the LINE$( ) elements used. We could have put these routines closer (with lower line numbers) to the front of the program; but since the original program used these addresses, we decided to keep them as they were.

Subroutine 26000 is as follows:

```
26000   REM  SINGLE DATE PAGE
26010   REM
26020   LINE$(1) = ""
26030   LINE$(2) = ""
26040   RETURN
26050   REM
26060   REM  ***************
26070   REM
26500   REM  RESTORE SINGLE DATE  DATA
26510   REM
```

```
26520   MM = VAL (LINE$(1))          : REM  MONTH
26530   DD = VAL (LINE$(2))          : REM  DAY
26540   RETURN
26550   REM
26560   REM  ***************
26570   REM
```

TEST POINT

Execute the program and verify that option 1 allows you to enter a month and day. While in the data entry screen program, test the help feature and the various editing commands available.

Random-Access Files

To edit any date's data, we must use random-access disk files. A *random-access file,* as the name suggests, is a data file that can be read from or written to in any order, i.e., randomly. Up to this point all the files used were sequential or text files. A sequential file is read in exactly the same order it is written in. (Applesoft has a command called POSITION that allows you to randomly access sequential files. It is difficult to use, however, and we recommend that if you need to access files randomly, then you use random-access files.)

Random-access files require a little more programming and bookkeeping than sequential files require, because the computer stores random files slightly differently than it stores sequential files. The following analogy will help explain the difference. A sequential file can be compared with a stack of papers. Such a stack is very compact, but it is difficult to insert or remove papers from the stack unless they happen to be next to each other in the stack. In contrast, a random-access file can be thought of as a stack of identical shoe boxes numbered sequentially, 1,2,3, ... Each box contains pieces of paper. Some of the boxes are full, some partially full, and some empty. When the contents of a box are to be read or changed, you tell your assistant to go get box number XX. The shoe boxes take up more room than the stack of papers, but with the boxes you can generally get to a particular set of papers faster.

In the computer, sequential files are written to the disk with the text packed tightly together (the stacks of paper). Random files are written in pieces called *records* (the shoe boxes); all the records in a file use exactly the same amount of space. When a random file is opened for processing, the computer is told how large the records are. The computer must also be told which record is to be accessed. The length of the data stored in a record must be less than or equal to the record size. Since, in general, the data is smaller than the record size, some space is wasted. However, since the computer can easily calculate exactly where the beginning of each record is, it can quickly read or write the data.

In the personal calendar program we wish to store ten lines of data with a maximum length of 25 characters each. In determining the record size, we must count the carriage return at the end of each line. Also, since we write text between double quotation marks, an additional two bytes are needed for each line. The record size is therefore

$$10(25 + 1 + 2) = 280 \text{ bytes.}$$

The records are consecutively numbered, beginning with 1. In our program January 1 is record 1, January 2 is record 2, etc.

Random-access files should be *initialized* before they are used. A file is initialized by writing blank or null lines into every record. The following program initializes a one-week calendar:

```
100   REM  CHAPTER 8 CALENDAR INITIALIZATION ROUTINE
110   REM
120   REM  CREATES AND CLEARS CALENDAR FILE
130   REM
140   HOME
150   PRINT "CREATING CALENDAR FILE"
160   NULL$ = CHR$(34) + CHR$(34):REM  TWO DOUBLE QUOTES MAKES NULL STRING
170   DAYS = 7       : REM  EXAMPLE FOR ONE WEEK ONLY
180   DSK$ = CHR$(4) : REM  ^D
190   PRINT DSK$;"OPEN CALENDAR,L280":REM  OPEN BYTE RECORD SIZE = 280
200   FOR X = 1 TO DAYS
210   PRINT DSK$;"WRITE CALENDAR,R";X
220   FOR Y = 1 TO 10
```

```
230   PRINT NULL$    :REM  WRITE OUT NULL STRING
240   NEXT Y
250   NEXT X
260   PRINT DSK$;"CLOSE CALENDAR"
270   END
```

Adjust the number of days in the routine above to the size of calendar you want. But note that a full, one-year calendar will fill most of a blank disk. So do not try to put a calendar on a disk already containing other files.

The following subroutines will read and write the random files. Note that when a line is written, it is surrounded by two quotation marks, CHR$(34). This feature is necessary if commas are to be used in the text. In Applesoft BASIC, fields can be on the same line if terminated with a comma. Therefore commas can be used in the text only if the text is written between quotation marks.

The read and write subroutines are as follows:

```
8000    REM  LOAD A DATE'S DATA
8010    REM
8020    PRINT                : REM  JUST TO MAKE SURE DISK COMMANDS WORK
8030    PRINT DSK$;"READ CALENDAR,R";DAY
8040    FOR X = 1 TO 10
8050    INPUT LINE$(X)
8060    NEXT
8070    PRINT DSK$           : REM  TURN DISK 10 OFF
8080    RETURN
8090    REM
8100    REM  **************
8110    REM
9000    REM  WRITE DATE'S DATA TO DISK
9010    REM
9020    PRINT          : REM  MAKE SURE DISK COMMANDS WORK
9030    PRINT DSK$;"WRITE CALENDAR,R";DAY: REM  SET RECORD NUMBER
9040    FOR  X = 1 TO 10
9050    PRINT CHR$(34);LINE$(X); CHR$(34): REM  SAVE WITH QUOTE MARKS
9060    NEXT
9070    PRINT DSK$           : REM  TURN DISK 10 OFF
```

```
9080    RETURN
9090    REM
9100    REM  ***************
9110    REM
```

Calendar Help Screens

The following illustrations show the four help screens that will be displayed. Please enter them, using the editor, as four separate files with the names specified.

1. File 'CHAP8 MENU HELP'

```
    ^APPOINTMENT MENU HELP^


THIS PROGRAM MAINTAINS A PERSONAL
APPOINTMENT CALENDAR. YOU CAN EDIT,
REVIEW OR PRINT ANY DAY'S APPOINTMENTS.

   ^OPTION 1^ ALLOWS YOU TO EDIT OR
   REVIEW ANY SINGLE DAY'S SCHEDULE.

   ^OPTION 2^ PRINTS A SINGLE DAY'S
   APPOINTMENTS.

   ^OPTION 3^ PRINTS SEVERAL DAYS
   APPOINTMENTS.

   ^OPTION 4^ DISPLAYS THIS HELP PAGE.

   ^OPTION 0^ STOPS THE PROGRAM AND
   RETURNS TO BASIC.

 ^SELECT OPTION, ENTER ITS NUMBER AND
         STRIKE RETURN^
```

```
  2.          File 'CHAP8 DATE HELP'

     ^APPOINTMENT DATE HELP^

PLEASE ENTER THE MONTH AND DAY YOU
WISH TO EDIT OR REVIEW. IF YOU ENTER
AN IMPROPER DATE THE COMPUTER WILL
ASSUME THAT YOU WISH TO EDIT JANUARY 1.

  3.          File 'CHAP8 2DAYS HELP'

       ^PRINTING GROUP OF DATES^

THIS SECTION PRINTS A GROUP OF DAYS
APPOINTMENTS. ENTER THE MONTH AND DAY
YOU WISH TO BEGIN PRINTING AND THE
LAST MONTH AND DAY YOU WISH TO PRINT.

  4.          File 'CHAP8 ENTRY HELP'

          ^PERSONAL CALENDAR^

THIS IS A PERSONAL CALENDAR PROGRAM.
YOU MAY ENTER TEXT ON ANY LINE. TO
EXIT STEP THROUGH THE LINES, USING
THE RETURN KEY, UNTIL THE CHANGES LINE
AND ENTER 0 (CR).
```

Calendar Data Entry Subroutine

The data entry system needs the name of the entry screen and two subroutines to move the data between the regular variable names and LINE$( ). Since we are not manipulating the data other than with the

data entry system, we are taking a shortcut here and *not* assigning regular variable names. Therefore the two subroutines become RETURNs, as follows:

```
25000   REM  SETUP FOR PAGE 1
25010   RETURN                  : REM  NONE NEEDED
25020   REM
25030   REM  ***************
25040   REM
25500   REM  RESTORE FOR PAGE 1
25510   RETURN                  : REM  NONE NEEDED
25520   REM
25530   REM  ***************
25540   REM
```

TEST POINT

In the menu, select option 1. In the date sceen, enter a date in January and verify that appointment information can be entered and edited. After the appointments have been edited, the program returns to the menu. Repeat this test now to verify that the data has been properly written to the disk and read from the disk. Finally, repeat the test again, and enter ^Q and verify that the help routine is working.

Option 2: Print a Day's Appointments

Option 2 uses some of the previous routines plus the report generator of Chapter 7. The report generator needs a report template name and a routine to move the data between the regular variable names and the LINE$( ) array. As in the data entry screen, since we are not manipulating the data, we can leave it in the LINE$( ) array. We take another shortcut here and use the data entry routine 25000. Hence the report generator program is quite small:

```
2000    REM  PRINT A SINGLE DAY
2010    REM
2020    GOSUB 7000              : REM  ACCEPT DATE
2030    GOSUB 8000              : REM  LOAD FROM DISK
```

```
2040    PAGE% = 1
2050    PAGE$(1) = "CHAP8 RPT"       : REM  NAME OF REPORT
2060    GOSUB 30000                  : REM  REPORT GENERATOR
2070    RETURN
2080    REM
2090    REM  ***************
2100    REM
```

Line 30065 of the report generator becomes

```
30065   ON PAGE% GOSUB 25000 : REM  FILL THE LINE$() ARRAY
```

And line 30487 below is added to force the printer to eject the page (form feed) after each day:

```
30487   PRINT CHR$(12) : REM  PRINT A FORM FEED
```

Your printer's slot number is entered in the following line 290. Verify that the line is correct.

```
290     DEVICE% = 1 : REM  PRINTER SLOT NUMBER
```

TEST POINT

Run the program and select option 2. If everything goes according to plan, the report should appear on your printer, and the program should return to the menu.

Option 3: Print a Group of Dates

Option 3 is only a little more complicated than option 2. In option 3 subroutine 10000 (shown below) is called to accept two dates instead of one, and then the program loops until all the days have been printed.

Here is option 3:

```
3000    REM  PRINT SEVERAL DAYS APPOINTMENTS
3010    REM
```

```
3020    GOSUB 10000                 : REM  GET TWO DATES
3030    PAGE% = 1                   : REM  FOR REPORT GENERATOR
3040    PAGE$(1) = "CHAP8 RPT"
3050    FOR DAY = D1 TO D2
3060    PRINT
3070    PRINT DSK$;"READ CALENDAR,R";DAY: REM  READ IN THE DATA
3080    GOSUB 8000                  : REM  LOAD THE DATA
3090    GOSUB 30000                 : REM  PRINT A REPORT
3100    NEXT DAY
3110    RETURN
3120    REM
3130    REM  ***************
3140    REM

10000   REM  ACCEPT TWO DATES
10010   REM
10020   PAGE% = 3                   : REM  FOR DATA ENTRY ROUTINE
10030   SCREEN$(PAGE%) = "CHAP8 2DAYS"
10040   GOSUB 20000                 : REM  DATA ENTRY ROUTINE
10050   MM = VAL (LINE$(1))
10060   DD = VAL (LINE$(2))
10070   GOSUB 7500                  : REM  CALCULATE DAY NUMBER
10080   D1 = DAY
10090   MM = VAL (LINE$(3))
10100   DD = VAL (LINE$(4))
10110   GOSUB 7500                  : REM  SECOND DAY
10120   D2 = DAY
10130   RETURN
10140   REM
10150   REM  ***************
10160   REM
```

TEST POINT

Execute and select option 3. Enter two dates about three days apart and verify that three reports are printed. Repeat and test the help system. You may wish to enter several days' appointments to make sure that the correct data is printed.

Option 4: Help

Option 4 uses the help subsystem and is a short routine. Enter the help text and the following routine:

```
4000    REM
4010    REM  MENU HELP OPTION
4020    REM
4030    HELP$ = "CHAP8 MENU HELP"    : REM  HELP SCREEN NAME
4040    GOSUB 21000                  : REM  HELP SUBROUTINE
4050    RETURN                       : REM  ALL DONE
4060    REM
4070    REM
4080    REM
```

TEST POINT

Select option 4 from the menu and the menu help text should appear.

Summary

You now have a working personal calendar program built from reusable subroutines. The number of new program lines required to create this program is small compared with its overall size. We hope this example has shown you the value of a library of subroutines.

USER INSTRUCTIONS

The calendar program maintains a daily personal calendar. You can edit, review, or print any day's or group of days' schedules. Help is available with every screen.

This menu is the first screen seen:

```
          APPOINTMENT CALENDAR MENU


1.  REVIEW DAY'S APPOINTMENTS

2.  PRINT ONE DAY'S APPOINTMENTS

3.  PRINT GROUP OF DAYS

4.  HELP

0.  EXIT TO BASIC
```

The following subsections contain the user instructions for the personal calendar system. Please add these instructions to your user's manual.

Option 1: Edit/Review a Day's Appointments

Option 1 allows you to edit or review any day's appointments. After the option is selected, you will be asked to enter a month and a day. The appointments for this day will be displayed and can be edited if desired.

Option 2: Print a Day's Appointments

Option 2 asks for the month and day to be printed. Make sure that the printer is on line.

Option 3: Print a Group of Dates

In option 3 you will be asked to enter the beginning month and day and the last month and day to be printed. These appointments will be printed one day to a page. Make sure that the printer is on line.

Option 4: Help

When you select option 4, a brief description of the various options is presented.

COMPLETE PERSONAL CALENDAR PROGRAM

Here is the listing for the complete personal calendar program:

```
100     REM
110     REM  CHAPTER 8 PERSONAL CALENDAR
120     REM
130     REM
140     REM
150     REM  THIS MAINTAINS AN ANNUAL PERSONAL CALENDAR. IT IS
160     REM  AN EXAMPLE OF HOW A LARGE PROGRAM CAN BE BUILT
170     REM  FROM THE SUBROUTINES DEVELOPED THROUGHOUT THE BOOK.
180     REM
190     REM
200     LAST% = 10          : REM  NUMBER OF FIELDS ON THE DATA ENTRY SCREEN
210     DIM LINE$(LAST%)    : REM  THESE ARE FOR DATA ENTRY ROUTINE
220     DIM SROW%(LAST%)
230     DIM SCOL%(LAST%)
240     DIM SMASK%(LAST%)
250     REM
260     REM  CALL THE MENU ROUTINE
270     REM
280     DSK$ = CHR$(4)                  : REM  ^D
290     DEVICE% = 1                     : REM  PRINTER SLOT NUMBER
300     PRINT DSK$;"OPEN CALENDAR,L280"    : REM  OPEN THE CALENDAR FILE
310     PRINT
320     SCREEN$ = "CHAP8 MENU"             : REM  NAME OF MENU SCREEN
330     REM  THE MENU ROUTINE WILL BRANCH TO THE APPROPRIATE ROUTINE
340     REM  AND RETURN HERE OR IT WILL END
350     REM
360     GOSUB 22000                     : REM  THE MENU ROUTINE
370     GOTO 320                        : REM  TRY AGAIN
```

```
380     REM
390     REM
400     REM
1000    REM  OPTION 1 EDIT/REVIEW ONE DATE
1010    REM
1020    GOSUB 7000                  : REM  ACCEPT THE DATE
1030    GOSUB 8000                  : REM  LOAD FROM DISK
1040    SCREEN$(1) = "CHAP8 ENTRY"  : REM  DATA SCREEN NAME
1050    PAGE% = 1                   : REM  USE THE FIRST PAGE
1060    GOSUB 20000                 : REM  EDIT THE DATA
1070    GOSUB 9000                  : REM  WRITE TO DISK
1080    RETURN
1090    REM
1100    REM  **************
1110    REM
2000    REM  PRINT A SINGLE DAY
2010    REM
2020    GOSUB 7000                  : REM  ACCEPT DATE
2030    GOSUB 8000                  : REM  LOAD FROM DISK
2040    PAGE% = 1
2050    PAGE$(1) = "CHAP8 RPT"      : REM  NAME OF REPORT
2060    GOSUB 30000                 : REM  REPORT GENERATOR
2070    RETURN
2080    REM
2090    REM  **************
2100    REM
3000    REM  PRINT SEVERAL DAYS APPOINTMENTS
3010    REM
3020    GOSUB 10000                 : REM  GET TWO DATES
3030    PAGE% = 1                   : REM  FOR REPORT GENERATOR
3040    PAGE$(1) = "CHAP8 RPT"
3050    FOR DAY = D1 TO D2
3060    PRINT
3070    PRINT DSK$;"READ CALENDAR,R";DAY: REM  READ IN THE DATA
3080    GOSUB 8000                  : REM  LOAD THE DATA
3090    GOSUB 30000                 : REM  PRINT A REPORT
3100    NEXT DAY
3110    RETURN
3120    REM
3130    REM  **************
```

```
3140    REM
4000    REM
4010    REM  MENU HELP OPTION
4020    REM
4030    HELP$ = "CHAP8 MENU HELP"     : REM  HELP SCREEN NAME
4040    GOSUB 21000                   : REM  HELP SUBROUTINE
4050    RETURN                        : REM  ALL DONE
4060    REM
4070    REM
4080    REM
7000    REM
7010    REM  ACCEPT A DATE
7020    REM
7030    REM
7040    PAGE% = 2                     : REM  ASSIGN TO DATA PAGE 2
7050    SCREEN$(PAGE%) = "CHAP8 DATE" : REM  DATA SCREEN NAME
7060    GOSUB 20000                   : REM  DATA ENTRY ROUTINE
7070    GOSUB 7500                    : REM  CALCULATE DAY NUMBER
7080    RETURN
7090    REM
7100    REM
7110    REM
7500    REM  CALCULATE DAY NUMBER
7510    YY = 1983                     : REM  CURRENT YEAR
7520    IF(MM = 0) OR (DD = 0) THEN DAY = 1:RETURN: REM  ERROR SO FORCE 1
7530    IF (MM > 12) OR (DD > 31) THEN DAY = 1:RETURN: REM  BAD DATE ENTERED
7540    JAN1 = 365 * YY + INT((YY - 1) / 4) - INT(.75 * (INT((YY - 1) / 100)
          + 1)) : REM  VALUE FOR JAN 1, YY
7550    IF MM > 3 THEN GOTO 7590      : REM  USE SECOND EQUATION
7560    DAY = 365 * YY + DD + 31 * ( MM - 1) + INT (( YY - 1 ) / 4) - INT
          (.75 * (INT(( YY - 1) / 100) + 1 )) - JAN1: REM  DAYS FROM JAN1
7570    RETURN
7580    REM
7590    REM  NOW FOR MARCH THRU DECEMBER
7600    REM
7610    DAY = 365 * YY + DD + 31 * (MM - 1) + INT (YY / 4) - INT (.75 *
          (INT( YY / 100) + 1)) - INT (.4 * MM + 2.3) - JAN1: REM  FOR
          MARCH THRU DECEMBER
7620    RETURN
7630    REM
```

```
7640    REM  ***************
7650    REM
8000    REM  LOAD A DATE'S DATA
8010    REM
8020    PRINT                  : REM  JUST TO MAKE SURE DISK COMMANDS WORK
8030    PRINT DSK$;"READ CALENDAR,R";DAY
8040    FOR X = 1 TO 10
8050    INPUT LINE$(X)
8060    NEXT
8070    PRINT DSK$                    : REM  TURN DISK IO OFF
8080    RETURN
8090    REM
8100    REM  ***************
8110    REM
9000    REM  WRITE DATE'S DATA TO DISK
9010    REM
9020    PRINT        : REM  MAKE SURE DISK COMMANDS WORK
9030    PRINT DSK$;"WRITE CALENDAR,R";DAY: REM  SET RECORD NUMBER
9040    FOR X = 1 TO 10
9050    PRINT CHR$(34);LINE$(X); CHR$(34): REM  SAVE WITH QUOTE MARKS
9060    NEXT
9070    PRINT DSK$                    : REM  TURN DISK IO OFF
9080    RETURN
9090    REM
9100    REM  ***************
9110    REM
10000   REM  ACCEPT TWO DATES
10010   REM
10020   PAGE% = 3                     : REM  FOR DATA ENTRY ROUTINE
10030   SCREEN$(PAGE%) = "CHAP8 2DAYS"
10040   GOSUB 20000                   : REM  DATA ENTRY ROUTINE
10050   MM = VAL (LINE$(1))
10060   DD = VAL (LINE$(2))
10070   GOSUB 7500                    : REM  CALCULATE DAY NUMBER
10080   D1 = DAY
10090   MM = VAL (LINE$(3))
10100   DD = VAL (LINE$(4))
10110   GOSUB 7500                    : REM  SECOND DAY
10120   D2 = DAY
10130   RETURN
```

```
10140   REM
10150   REM  ***************
10160   REM

20000   REM  DATA ENTRY * SCREEN PROCESSOR
20005   REM
20010   REM
20015   REM
20020   REM  DISPLAYS SCREEN, LOADS MASK DATA
20025   REM  DISPLAYS DEFAULT VALUES
20030   REM  EDITS AND SAVES VALUES
20035   REM
20040   REM  VARIABLES USED:
20045   REM    LINE$()   HOLDS EDIT DATA
20050   REM    ITEM%     NUMBER TO EDIT
20055   REM    PAGE%     PAGE TO EDIT
20060   REM    SROW%()   FIELD ROW NUMBER
20065   REM    SCOL%()   FIELD COL NUMBER
20070   REM    SMASK$()  FIELD MASK$
20075   REM    SCREEN$() NAME OF SCREEN
20080   REM    LINE%     CURRENT LINE BEING EDITED
20085   REM
20090   REM
20095   REM
20100   REM
20105   REM  EDIT A DATA SCREEN
20110   REM
20115   REM  SHOW THE DATA SCREEN
20120   REM
20125   ITEM% = 0                        : REM  CLEAR NUMBER OF ITEMS
20130   NOPAUSE% = 1                     : REM  INFORM HELP SCREEN NOT TO PAUSE
20135   COL% = 1                         : REM  RESET POSITION COUNTER
20140   HELP$ = SCREEN$(PAGE%)           : REM  NAME OF SCREEN TO PROCESS
20145   GOSUB 21000                      : REM  SHOW SCREEN
20150   NOPAUSE% = 0                     : REM  RESET TO PAUSE
20155   ON PAGE% GOSUB 25000,26000,27000
20160   GOSUB 20295                      : REM  SHOW DEFAULT VALUES
20165   GOSUB 20350                      : REM  EDIT DATA
20170   ON PAGE% GOSUB 25500,26500,27500: REM  SAVE THE EDITED DATA
20175   IF HELP% > 0 THEN HELP$ = HELP$ + " HELP": GOSUB 21000 :
          GOTO 20000                     : REM  SHOW HELP SCREEN AND START OVER
```

```
20180  RETURN
20185  REM
20190  REM  **************
20195  REM
20200  REM
20205  REM  SET FIELD PARAMETERS
20210  REM
20215  ITEMS% = ITEMS% + 1       : REM  INC FIELD COUNTER
20220  SMASK$(ITEMS%) = ""       : REM  CLEAR IT
20225  SROW%(ITEMS%) = ROW% + 1 : REM  CURRENT ROW NUMBER
20230  SCOL%(ITEMS%) = COL%      : REM  CURRENT COLUMN NUMBER
20235  PRINT " " ;               : REM  PRINT SPACE
20240  Z = Z + 1
20245  ENTRY$ = MID$ (A$,Z,1)    : REM  GET ONE CHARACTER
20250  IF ENTRY$ = ">" THEN GOTO 20270 : REM  ARE WE AT END OF MASK?
20255  SMASK$(ITEMS%) = SMASK$(ITEMS%) + ENTRY$ : REM  ADD TO FIELD MASK
20260  COL% = COL% + 1           : REM  INC COL CNT
20265  GOTO 20235                : REM  GET NEXT CHAR
20270  ENTRY$ = " "              : REM  CLEAR ENTRY$
20275  RETURN
20280  REM
20285  REM  **************
20290  REM
20295  REM  SHOW DEFAULT VALUES
20300  REM
20305  FOR X = 1 TO ITEMS%
20310  VTAB SROW%(X)             : REM  LINE
20315  POKE 36, SCOL%(X)         : REM  COLUMN - HTAB
20320  PRINT LINE$(X);           : REM  DATA
20325  NEXT X
20330  RETURN
20335  REM
20340  REM  **************
20345  REM
20350  REM  EDIT THE DATA FIELDS
20355  REM
20360  LINE% = 1                 : REM  START IN DATA FIELD
20365  ENTRY$ = LINE$(LINE%)     : REM  FIELD
20370  ROW% = SROW%(LINE%)       : REM  ROW
20375  COL% = SCOL%(LINE%)       : REM  COL
20380  MASK$ = SMASK$(LINE%)     : REM  MASK
```

```
20385   GOSUB 50000              : REM  EDIT FIELD
20390   LINE$(LINE%) = ENTRY$    : REM  SAVE THE EDITED DATA FIELD
20395   IF HELP% > 0 THEN RETURN : REM  HELP REQUESTED IN THE FIELD
20400   IF (CTRL% = 3) AND (LINE% > 1) THEN LINE% = LINE% - 1 :
          GOTO 20365             : REM  UP ARROW
20405   IF CTRL% = 3 THEN GOTO 20365  : REM  UP ARROW BUT ALREADY AT TOP
20410   IF CTRL% = 27 THEN GOTO 20425 : REM  ESC SO GO TO BOTTOM
20415   IF LINE% < ITEMS% THEN LINE% = LINE% + 1: GOTO 20365: REM  MOVE
          DOWN A LINE
20420   REM
20425   REM  VERIFY ENTRIES
20430   REM
20435   VTAB 24                  : REM  GOTO BOTTOM
20440   HTAB 10
20445   PRINT "CHANGE WHICH ITEM?";
20450   MASK$ = "##"             : REM  ALLOW HELP AND UP TO 99 FIELDS
20455   ENTRY$ = "0"             : REM  DEFAULT
20460   ROW% = 24
20465   COL% = 30
20470   GOSUB 50000              : REM  EDIT DATA
20475   IF CTRL% = 3 THEN LINE% = ITEMS%: GOTO 20365: REM  UP ARROW
20480   LINE% = VAL (ENTRY$)     : REM  LINE TO EDIT
20485   IF LINE% = 0 THEN RETURN : REM  ALL DONE WITH THIS SCREEN
20490   IF (LINE% < = ITEMS%) AND (LINE% > 0) THEN GOTO 20365 : REM  EDIT
          THE REQUESTED FIELD
20495   GOTO 20425               : REM  BAD ENTRY
20500   REM
20505   REM  ***************
20510   REM
21262   IF ENTRY$ = "<" THEN GOSUB 20205 : REM  ASSIGN FIELD CHARACTERISTICS
21263   IF ENTRY$ < > CHR$ (13) THEN COL% = COL% + 1 : REM  INC COLUMN
          POSITION COUNTER
21286   COL% = 1                 : REM  RESET COLUMN COUNTER
21457   IF NOPAUSE% < > 0 THEN PRINT DSK$;"CLOSE ";SCREEN$: RETURN : REM
          RETURN WITHOUT A PAUSE
51124   IF KEY% = 10 THEN CTRL% = 2        : REM  ^J LINE FEED 51124
51126   IF KEY% = 11 THEN CTRL% = 3        : REM  ^K UP ARROW EXIT 51126
51184   IF KEY% = 27 THEN CTRL% = 27       : REM  ESC EXIT 51184

21000   REM  SHOW HELP * SCREEN DISPLAY ROUTINE
21005   REM
```

```
21010  REM
21015  REM
21020  REM  DISPLAYS SCREEN AND USES INVERSE
21025  REM  WILL PAUSE WHEN THE SCREEN IS FULL
21030  REM  PROVIDES USER TIME TO READ
21035  REM
21040  REM
21045  REM  IMPORTANT  VARIABLES USED:
21050  REM    LINE%      NUMBER OF LINES TO DISPLAY
21060  REM    Y          INVERSE FLAG
21065  REM    ROW%       TOTAL NUMBER OF LINES DISPLAYED
21070  REM    XX         NUMBER OF LINES IN CURRENT SCREEN
21075  REM    NOPAUSE% 1 = DO NOT PAUSE AT END OF PAGE. 0 = PAUSE
21080  REM    HELP$      NAME OF HELP TEXT FILE
21085  REM
21090  REM  LOAD AND DISPLAY THE SCREEN
21095  REM
21100  REM  SCREEN READ ONE CHARACTER AT A TIME
21110  REM  INVERSE TOGGLED ON '^' CHARACTER
21115  REM
21120  REM
21125  REM
21130  REM
21135  ROW% = 0                 : REM  CLEAR COUNTER
21140  XX = 0
21145  DSK$ = CHR$ (4)          : REM  DISK ^D
21150  PRINT                    : REM  CLEAR ANY DSK COMMANDS
21155  PRINT DSK$;"OPEN ";HELP$
21160  PRINT DSK$;"READ ";HELP$
21165  REM
21170  REM  READ THE NUMBER OF LINES ON THE SCREEN
21175  REM
21180  INPUT LINE%
21185  REM
21190  REM  CLEAR THE COUNTERS
21195  REM
21200  ROW% = 0
21205  REM
21215  Y = 0                    : REM  INVERSE FLAG
21220  REM
21225  REM  INPUT THE SCREEN
```

```
21230   REM
21235   HOME                        : REM  CLEAR SCREEN
21237   IF ROW% = LINE% THEN PRINT DSK$;"CLOSE ";HELP$: RETURN : REM
          ALL DONE
21240   INPUT A$: REM  GET A TEXT LINE
21242   IF MID$ (A$,1,1) = "#" THEN GOSUB 22180: GOTO 21237: REM  21242
          PROCESS MENU FILE NAMES
21245   FOR Z = 1 TO LEN (A$)
21250   ENTRY$ = MID$ (A$,Z,1)
21255   IF ENTRY$ = "@" THEN GOSUB 21430: REM  PAUSE WANTED
21265   IF ENTRY$ = "^" THEN GOSUB 21380: REM  TOGGLE INVERSE VIDEO
21270   PRINT ENTRY$;
21275   NEXT Z
21280   PRINT
21285   ROW% = ROW% + 1             : REM  INCREMENT LINE COUNTER
21290   XX = XX + 1                 : REM  INCREMENT THIS PAGE LINE COUNTER
21295   IF (ROW% = LINE%) OR (XX = 22) THEN GOSUB 21430: REM  DO I PAUSE?
21300   IF ROW% = LINE% THEN PRINT DSK$;"CLOSE ";HELP$: RETURN :
          REM  RETURN TO THE CALLER
21305   REM
21310   GOTO 21240                  : REM  GET NEXT CHR
21315   REM
21320   REM  ***************
21325   REM
21375   REM
21380   REM  TOGGLE INVERSE ON/OFF
21385   REM
21390   ENTRY$ = ""
21395   IF Y > 0 THEN Y = 0: NORMAL : RETURN : REM  CLEAR INVERSE
21400   INVERSE                     : REM  TURN INVERSE ON
21405   Y = 1                       : REM  SET FLAG
21410   RETURN
21415   REM
21420   REM  ***************
21425   REM
21430   REM  PAUSE AND ASK FOR MORE?
21435   REM
21440   REM
21445   IF NOPAUSE% > 0 THEN RETURN : REM  PROGRAMMER DOES NOT WANT PAUSE
21450   PRINT                       : REM  CLEAR GET COMMAND
21455   PRINT DSK$: REM  TURN READ OFF
```

```
21457   IF NOPAUSE% < > 0 THEN PRINT DSK$;"CLOSE ";SCREEN$: RETURN : REM
          RETURN WITHOUT A PAUSE
21460   VTAB 23: REM  PAUSE LINE
21465   ENTRY$ = "": REM  MAKE SURE NOTHING HERE
21470   INPUT "DO YOU WISH MORE? ";ENTRY$
21475   HOME                        : REM  CLEAR THE SCREEN
21480   IF ENTRY$ = "N" THEN YY = LINE%: RETURN : REM  THEY WANT OUT
21485   PRINT DSK$;"READ ";HELP$    : REM  TURN DISK INPUT BACK ON
21490   XX = 0                      : REM  RESET PAGE LINE COUNTER
21495   ENTRY$ = ""                 : REM  CLEAR ANSWER
21500   RETURN                      : REM  GET NEXT LINE
21505   REM
21510   REM  ***************
21515   REM

22000   REM  MENU DRIVER *
22005   REM
22010   REM
22015   REM
22020   REM  DISPLAYS MENU AND CHAINS TO PROGRAM OF USERS CHOICE
22025   REM
22030   REM
22035   REM  IMPORTANT VARIABLES USED:
22040   REM  LINE$() CONTAINS NAME OF PROGRAM TO CHAIN TO
22045   REM
22050   DSK$ = CHR$ (4)             : REM  DISK ^D
22055   ITEMS% = 0                  : REM  NUMBER OF OPTIONS
22060   NOPAUSE% = 1                : REM  INFORM HELP SYSTEM NOT TO PAUSE
22065   HELP$ = SCREEN$             : REM  SEND THE MENU NAME
22070   GOSUB 21000                 : REM  SHOW THE SCREEN USING HELP ROUTINE
22075   NOPAUSE% = 0                : REM  RESTORE THE FLAG FOR OTHERS
22080   REM
22085   REM  ASK FOR OPTION
22090   REM
22095   VTAB 3
22100   POKE 36, 10                 : REM  HTAB
22105   PRINT "PLEASE SELECT OPTION"
22110   ROW% = 3
22115   COL% = 35
22120   MASK$ = "##"                : REM  ALLOW HELP REQUEST
22125   ENTRY$ = "0"
```

```
22130   GOSUB 50000                : REM  ACCEPT OPTION
22135   IF HELP% THEN HELP$ = SCREEN$ + " HELP": GOSUB 21000 :
          GOTO 22000: REM  RESPONDED TO HELP REQUEST
22140   X = VAL (ENTRY$)           : REM  OPTION SELECTED
22150   IF X = 0 THEN HOME : END : REM  RETURN TO BASIC
22152   IF LINE$(X) = "HELP" THEN HELP% = 1:HELP$ = SCREEN$ + " HELP": GOSUB
          21000: GOTO 22000: REM  RESPONDED TO HELP REQUEST
22155   PRINT                      : REM  CLEAR FOR DISK COMMAND
22160   ON X GOSUB 1000,2000,3000,4000
22165   RETURN
22170   REM  ***************
22175   REM
22180   REM  ACCEPT A CHAIN NAME
22185   REM
22190   Z = VAL ( MID$ (A$,2,2))   : REM  GET THE OPTION NUMBER
22195   IF ITEM% < Z THEN ITEM% = Z: REM  ADJUST COUNTER
22200   LINE$(Z) = MID$ (A$,4)     : REM  MOVE THE FILE NAME
22205   ROW% = ROW% + 1            : REM  INCREMENT COUNTER
22210   RETURN
22215   REM
22220   REM  ***************
22225   REM

25000   REM  SETUP FOR PAGE 1
25010   RETURN                     : REM  NONE NEEDED
25020   REM
25030   REM  ***************
25040   REM
25500   REM  RESTORE FOR PAGE 1
25510   RETURN                 : REM  NONE NEEDED
25520   REM
25530   REM  ***************
25540   REM
26000   REM  SINGLE DATE PAGE
26010   REM
26020   LINE$(1) = ""
26030   LINE$(2) = ""
26040   RETURN
26050   REM
26060   REM  ***************
```

```
26070   REM
26500   REM  RESTORE SINGLE DATE DATA
26510   REM
26520   MM = VAL (LINE$(1))          : REM  MONTH
26530   DD = VAL (LINE$(2))          : REM  DAY
26540   RETURN
26550   REM
26560   REM  **************
26570   REM
27000   REM
27010   REM
27020   FOR X = 1 TO 4
27030   LINE$(X) = ""                : REM  NULL STRING
27040   NEXT X
27050   RETURN
27060   REM
27070   REM  **************
27080   REM
27500   REM  CHANGE NOTHING FOR TWO DATES
27510   REM
27520   RETURN
27530   REM
27540   REM  **************
27550   REM

30000   REM  DATA PRINT SUBROUTINE
30005   REM
30010   REM  THIS FILLS IN A DATA PAGE AND SENDS IT TO THE PRINTER OR DISK
30015   REM
30020   REM  BE SURE TO ADD SPECIAL PRINTER COMMANDS
30025   SCREEN$ = PAGE$(PAGE%)       : REM  THE PAGE TO FILL
30030   HOME                         : REM  INFORM THE USER OF PRINTING
30035   VTAB 10
30040   POKE 36, 10                  : REM  HTAB
30045   PRINT "PROCESSING ";SCREEN$
30050   VTAB 12
30055   POKE 36, 15                  : REM  HTAB
30060   PRINT "PLEASE WAIT"
30065   ON PAGE% GOSUB 25000
30070   DSK$ = CHR$ (4)              : REM  DISK COMMAND CODE
```

```
30075  PRINT DSK$;"OPEN ";SCREEN$: REM  OPEN THE PAGE FOR INPUT
30080  IF DEVICE% < > 0 THEN PRINT DSK$;"PR#";DEVICE%: GOTO 30115: REM
         SEND DIRECTLY TO THE PRINTER
30085  REM
30090  REM  PRINT IT TO A DISK FILE
30095  REM
30100  PRINT DSK$;"OPEN ";SCREEN$;" REPORT"
30105  PRINT DSK$;"DELETE ";SCREEN$;" REPORT": REM  ERASE ANY OLD FILE
30110  PRINT DSK$;"OPEN ";SCREEN$;" REPORT": REM  OPEN A CLEAN NEW FILE
30115  PRINT DSK$;"READ ";SCREEN$: REM  GET THE NUMBER OF LINES
30120  INPUT ITEMS%
30125  REM
30130  REM
30135  ITEMS% = ITEMS% - 1        : REM  DECREMENT COUNTER
30140  IF ITEMS% < 0 THEN GOTO 30475: REM  ALL DONE SO EXIT
30145  PRINT DSK$;"READ ";SCREEN$: REM  READ THE DATA PAGE
30150  INPUT ENTRY$               : REM  GET A LINE FROM THE DATA PAGE
30155  IF A$ < > "&" THEN C$ = "": REM  CLEAR THE OUTPUT LINE
30160  IF A$ = "&" THEN GOSUB 30240: REM  STRIP LEADING SPACES
30165  REM
30170  REM  PROCESS ENTRY$ ONE CHAR AT A TIME LOOKING FOR INSERTS
30175  REM
30180  FOR X = 1 TO LEN (ENTRY$) : REM  STEP DOWN THE LINE
30185  A$ = MID$ (ENTRY$,X,1)     : REM  GET ONE CHARACTER
30190  IF A$ = "<" THEN GOSUB 30275: GOTO 30205: REM  DO AN INSERTION
30195  IF A$ = "&" THEN X = LEN (ENTRY$): GOTO 30205: REM  CONTINUATION
         SYMBOL
30200  C$ = C$ + A$               : REM  BUILD THE OUTPUT STRING
30205  NEXT X
30210  IF DEVICE% = 0 THEN PRINT DSK$;"WRITE ";SCREEN$;" REPORT": REM
         SEND OUTPUT TO DISK
30215  IF A$ < > "&" THEN PRINT C$: REM  OUTPUT THE STRING
30220  GOTO 30135
30225  REM  ***************
30230  REM
30235  REM
30240  REM  REMOVE THE LEADING SPACES
30245  REM
30250  IF MID$ (ENTRY$,1,1) = " " THEN ENTRY$ = MID$ (ENTRY$,2):
         GOTO 30250: REM  FOUND ONE SO REMOVE IT
30255  RETURN
```

```
30260  REM  **************
30265  REM
30270  REM
30275  REM  INSERT A FIELD INTO THE LINE
30280  REM
30285  REM  TWO MODES:
30290  REM  1) INSERT AND CONCATENATE
30295  REM  2) INSERT BUT DO NOT CONCATENATE
30300  REM  MODE 1 IS USED WHEN NO SPACES EXIST BETWEEN <> SYMBOLS
30305  REM  MODE 2 IS USED IF A SPACE EXISTS BETWEEN <> SYMBOLS
30310  REM
30315  REM
30320  REM
30325  REM
30330  REM  FIRST REMOVE THE <> SYMBOLS
30335  REM
30340  Y = 0                      : REM  DEFAULT TO MODE 1
30345  X = X + 1
30350  IF X > LEN (ENTRY$) THEN A$ = "": RETURN : REM
         ONLY ONE SYMBOL SO ERROR
30355  B$ = MID$ (ENTRY$,X,1)     : REM  GET ONE CHARACTER
30360  A$ = A$ + B$
30365  IF B$ < > ">" THEN GOTO 30345: REM  NOT DONE SO GET ANOTHER CHARACTER
30370  REM  LOOK FOR A SPACE TO SET MODE
30375  FOR Z = 1 TO LEN (A$)
30380  IF A$ = " " THEN Y = Z:Z = LEN (A$)
30385  NEXT Z
30390  IF Y = 0 THEN Z = VAL ( MID$ (A$,2, LEN (A$) - 1))
30395  IF Y < > 0 THEN Z = VAL (MID$ (A$,2,Y - 1)): REM  GET THE FIELD NUMBER
30400  C$ = C$ + LINE$(Z)         : REM  ADD THE FIELD
30405  IF Y = 0 THEN A$ = "":  RETURN : REM  MODE 1 SO ALL DONE
30410  REM
30415  REM MODE 2 SELECTED SO WE MUST FILL WITH SPACES
30420  REM
30425  IF LEN (LINE$(Z) = LEN (A$) THEN RETURN : REM  NOTHING TO CLEAR
30430  Y = LEN (A$) - LEN (LINE$(Z))
30435  FOR Z = 1 TO Y
30440  C$ = C$ + " "              : REM  ADD THE SPACES
30445  NEXT Z
30450  A$ = ""
30455  RETURN                     : REM  ALL DONE
```

```
30460   REM  ***************
30465   REM
30470   REM
30475   REM  CLOSE EVERYTHING AND RETURN
30480   REM
30485   PRINT DSK$;"CLOSE ";SCREEN$
30487   PRINT CHR$(12) : REM  FORM FEED
30490   IF DEVICE% = 0 THEN PRINT DSP$;"CLOSE ";SCREEN$;" REPORT"
30495   IF DEVICE% < > 0 THEN PRINT DSK$;"PR#0": REM  RETURN TO
          SCREEN OUTPUT
30500   HOME                        : REM  CLEAR THE SCREEN
30505   RETURN
30510   REM  ***************
30515   REM
30520   REM

50000   REM  BASIC LINE EDITOR
50005   REM
50010   REM
50015   REM  THIS IS A BASIC LINE EDITOR
50020   REM
50025   REM  THE PROGRAMMER CALLS IT USING THE FOLLOWING VARIABLES
50030   REM
50035   REM  ROW% =>  SCREEN LINE NUMBER
50040   REM  COL% =>  SCREEN COLUMN NUMBER
50045   REM  ENTRY$ => TEXT TO BE EDITED
50050   REM  MASK$ => DATA TYPE TO BE ALLOWED
50055   REM  WHERE:
50060   REM  A = ALPHANUMERIC
50065   REM  # = NUMBER FIELD ONLY
50070   REM  Y = YES/NO FIELD
50075   REM  Q = HELP REQUEST OK, USE IN ANY CHARACTER
50080   REM  THE LENGTH OF MASK$ IS THE MAXIMUM LENGTH OF THE
50085   REM  INPUT STRING
50090   REM
50095   REM
50100   PLACE% = 1                  : REM  SET THE STARTING POSITION
50105   REM
50110   FILL$ = "."                 : REM  DISPLAY DOTS
50115   HELP% = 0                   : REM  CLEAR THE HELP FLAG
50120   CTRL% = 0                   : REM  CLEAR THE EXIT FLAG
```

```
50125   GOSUB 52130             : REM  DISPLAY ENTRY$
50130   GOSUB 50165             : REM  EDIT THE STRING
50135   FILL$ = " "             : REM  CLEAR THE SCREEN
50140   GOSUB 52130             : REM  DISPLAY ENTRY$
50145   RETURN                  : REM  GO BACK TO CALLER
50150   REM
50155   REM  ***************
50160   REM
50165   REM  EDIT THE ENTRY$ FIELD
50170   REM
50175   REM  POSITION THE CURSOR
50180   REM
50185   VTAB ROW%               : REM  VERTICAL POSITION
50190   GOSUB 52000             : REM  PRINT THE CHARACTER IN INVERSE
50195   REM
50200   REM  ACCEPT A KEY FROM THE KEYBOARD
50205   REM
50210   KEY% = PEEK (49152)     : REM  TEST FOR INPUT
50215   IF KEY% < 128 THEN GOTO 50210 : REM  LOOP UNTIL ENTRY
50220   REM
50225   REM  IF HERE THEN A KEY PUSHED
50230   REM
50235   XX = PEEK (49168)       : REM  CLEAR KEYBOARD
50240   KEY% = KEY% - 128       : REM  STRIP OFF FLAG BIT
50245   REM
50250   REM  PROCESS THE KEY
50255   REM
50260   GOSUB 50295             : REM  KEY% PROCESSOR
50265   IF HELP% > 0 THEN RETURN : REM  HELP REQUESTED BY USER
50270   IF CTRL% > 0 THEN GOSUB 52070: RETURN : REM  CONTROL KEY EDIT
50275   GOTO 50210              : REM  GET THE NEXT KEY
50280   REM
50285   REM  ****************************
50295   REM  TEST FOR CONTROL KEY
50300   REM
50305   IF KEY% < = 31 THEN GOSUB 51000: RETURN : REM  PROCESS AND RETURN
50310   REM
50315   REM  MUST BE AN ALPHANUMERIC
50320   REM
50325   REM  TEST THE MASK TO DETERMINE DATA TYPE
50330   REM
```

```
50335   IF MID$  (MASK$,PLACE%,1) = "A" THEN GOSUB 50900: RETURN
50340   IF MID$  (MASK$,PLACE%,1) = "#" THEN GOSUB 50390: RETURN
50345   IF MID$  (MASK$,PLACE%,1) = "Y" THEN GOSUB 50440: RETURN
50355   REM
50360   REM  BAD MASK CHARACTER
50365   REM
50370   RETURN
50375   REM
50380   REM  ****************************
50385   REM
50390   REM  ACCEPT A NUMBER
50395   REM
50400   REM  TEST TO SEE IF IT IS A VALID NUMERIC TYPE OF CHARACTER
50405   REM
50410   IF (KEY% < 45) OR (KEY% > 57) THEN RETURN: REM  BAD KEY
50415   IF KEY% = 47 THEN RETURN : REM  BAD KEY ALSO
50420   GOSUB 50900              : REM  GOOD KEY SO ACCEPT IT
50425   RETURN
50430   REM  ************************************
50435   REM
50440   REM  TEST FOR YES OR NO
50445   IF (KEY% < > 89) AND (KEY% < > 78) THEN RETURN : REM  BAD KEY
50450   GOSUB 50900              : REM  ACCEPT IT
50455   RETURN
50460   REM  ************************************
50465   REM
50900   REM  PRINT KEY% AND ADD TO ENTRY$
50905   REM
50910   IF INSERT% = 1 THEN GOSUB 51315 : REM  INSERT A SPACE
50915   TXTSIZE% = LEN (ENTRY$)  : REM  MAKE SURE WE HAVE CORRECT TXTSIZE%
50922   REM  ADD TO END OF ENTRY
50925   IF PLACE% > TXTSIZE% THEN ENTRY$ = ENTRY$ + CHR$ (KEY%): GOTO 50945
50926   REM  ADD AS FIRST CHARACTER
50930   IF PLACE% = 1 THEN ENTRY$ = CHR$(KEY%) + MID$(ENTRY$,PLACE% + 1): GOTO 50945
50932   REM  ADD AS LAST CHARACTER
50935   IF PLACE% = TXTSIZE% THEN
          ENTRY$ = LEFT$(ENTRY$,PLACE% - 1) + CHR$(KEY%): GOTO 50945
50936   REM  ADD IN THE MIDDLE SOMEWHERE
50940   ENTRY$ = LEFT$(ENTRY$,PLACE% - 1) + CHR$(KEY%) + MID$(ENTRY$,PLACE% + 1)
50945   TXTSIZE% = LEN (ENTRY$)
50946   REM  IF TOO BIG TRUNCATE IT
```

```
50950   IF TXTSIZE% > MAXSIZE% THEN ENTRY$ = LEFT$ (ENTRY$,MAXSIZE%)
50955   REM
50960   REM  NEED TO MOVE RIGHT ONE PLACE
50965   REM
50970   GOSUB 51425                  : REM  RIGHT ARROW
50975   RETURN
50980   REM
50985   REM ***************
50990   REM
51000   REM  PROCESS A CONTROL KEY
51005   REM
51010   REM  EXIT KEYS SUCH AS RETURN SET CTRL%
51015   REM
51020   REM
51025   REM  ^A = 1  > PREVIOUS WORD
51030   REM  ^D = 4  > DELETE THIS CHARACTER
51035   REM
51040   REM  ^F = 6  > FILL WITH A SPACE
51045   REM  ^H = 8  > LEFT ARROW
51050   REM  ^N = 14 > SKIP TO END
51055   REM  ^Q = 17 > HELP REQUEST
51060   REM  ^U = 21 > RIGHT ARROW
51065   REM  ^W = 23 > NEXT WORD
51070   REM  ^Y = 25 > ERASE TO END
51075   REM  IGNORE ALL OTHER KEYS
51080   REM
51085   CTRL% = 0                    : REM  CLEAR EXIT FLAG
51090   IF KEY% = 6 THEN GOSUB 51280: RETURN : REM  INSERT
51095   INSERT% = 0                  : REM  TURN INSERT OFF
51100   IF KEY% = 1 THEN GOSUB 51555 : REM  PREVIOUS WORD
51105   REM
51110   IF KEY% = 4 THEN GOSUB 51210 : REM  DELETE
51115   REM
51120   IF KEY% = 8 THEN GOSUB 51380 : REM  LEFT ARROW
51125   REM
51130   IF KEY% = 13 THEN CTRL% = 1: REM  RETURN KEY
51135   REM  CHECK HELP REQUEST
51140   IF KEY% = 17 THEN HELP% = 1: RETURN : REM  HELP REQUEST
51145   REM
51150   IF KEY% = 14 THEN GOSUB 51680: REM  GOTO END
51155   REM
```

```
51160   IF KEY% = 21 THEN GOSUB 51425: REM  RIGHT ARROW
51165   REM
51170   IF KEY% = 23 THEN GOSUB 51475: REM  NEXT WORD
51175   REM
51180   IF KEY% = 25 THEN GOSUB 51630: REM  ERASE TO END
51184   IF KEY% = 27 THEN CTRL% = 27 : RETURN : REM  51184 ESC
51185   REM
51190   RETURN
51195   REM
51200   REM  ***************
51205   REM
51210   REM  DELETE AND PACK
51215   REM
51220   TXTSIZE% = LEN (ENTRY$)
51225   IF TXTSIZE% = 0 THEN RETURN : REM  NOTHING TO DELETE
51230   IF TXTSIZE% = 1 THEN ENTRY$ = "":PLACE% = 1:GOTO 51250: REM  DELETE LINE
51235   IF PLACE% = 1 THEN ENTRY$ = MID$ (ENTRY$,2): GOTO 51250
51240   IF PLACE% > = TXTSIZE% THEN
          ENTRY$ = LEFT$(ENTRY$,TXTSIZE% - 1):PLACE% = PLACE % - 1:GOTO 51250
51245   ENTRY$ = LEFT$ (ENTRY$,(PLACE% - 1)) + MID$ (ENTRY$,PLACE% + 1)
51250   GOSUB 52130              : REM  PRINT NEW STRING
51255   GOSUB 52000              : REM  PRINT INVERSE
51260   RETURN
51265   REM
51270   REM  *********************************
51275   REM
51280   REM  TOGGLE THE INSERT MODE
51285   REM
51290   IF INSERT% = 1 THEN INSERT% = 0: RETURN : REM  TURN IT OFF
51295   INSERT% = 1              : REM  TURN IT ON
51300   RETURN
51305   REM  *********************************
51310   REM
51315   REM  INSERT A CHARACTER
51320   REM
51325   REM
51330   REM  IS IT THE FIRST CHARACTER?
51335   IF PLACE% = 1 THEN ENTRY$ = " " + ENTRY$: GOTO 51350
51340   REM  INSERT IN THE MIDDLE
51345   ENTRY$ = LEFT$ (ENTRY$,PLACE% - 1) + " " + MID$ (ENTRY$,PLACE%)
51350   GOSUB 52130              : REM  PRINT THE FIELD
```

```
51355   GOSUB 52070              : REM  REPOSITION CURSOR
51360   RETURN
51365   REM
51370   REM  ***************
51375   REM
51380   REM  LEFT ARROW
51385   REM
51390   GOSUB 52070              : REM  DISPLAY NORMAL
51395   IF PLACE% > 1 THEN PLACE% = PLACE% - 1 : REM  MOVE LEFT ONE
51400   GOSUB 52000              : REM  DISPLAY INVERSE
51405   RETURN
51410   REM
51415   REM  ***************
51420   REM
51425   REM  RIGHT ARROW
51430   REM
51435   IF MID$ (ENTRY$,PLACE%,1) = "" THEN RETURN
51440   GOSUB 52070              : REM  DISPLAY AS NORMAL
51445   IF PLACE% < MAXSIZE% THEN  PLACE% = PLACE% + 1
51450   GOSUB 52000              : REM  DISPLAY AS INVERSE
51455   RETURN
51460   REM
51465   REM  ***************
51470   REM
51475   REM  SKIP TO NEXT WORD
51480   REM
51485   REM
51490   IF PLACE% = > TXTSIZE% THEN RETURN : REM  ALREADY AT END
51495   GOSUB 52070              : REM  REMOVE CURSOR
51500   PLACE% = PLACE% + 1      : REM  LOOK FOR FIRST SPACE
51505   IF PLACE% = TXTSIZE% THEN GOTO 51530
51510   IF MID$ (ENTRY$,PLACE%,1) < > " " THEN GOTO 51500: REM IS IT A SPACE?
51515   PLACE% = PLACE% + 1      : REM  MOVE RIGHT ONE
51520   IF PLACE% = TXTSIZE% THEN GOTO 51530
51525   IF MID$ (ENTRY$,PLACE%,1) = " " THEN GOTO 51515: REM  SKIP OVER SPACES
51530   GOSUB 52000              : REM  DISPLAY CURSOR
51535   RETURN
51540   REM
51545   REM  ***************
51550   REM
51555   REM  SKIP TO PREVIOUS WORD
```

```
51560   REM
51565   IF PLACE% = 1 THEN RETURN : REM  AT THE FRONT ALREADY
51570   GOSUB 52070               : REM  REMOVE CURSOR
51575   PLACE% = PLACE% - 1       : REM  LOOK FOR SPACE
51580   IF PLACE% = 1 THEN GOTO 51610: REM  FORCE MOVE AT LEAST ONE SPACE
51585   IF MID$(ENTRY$,PLACE%,1) = " " THEN GOTO 51575: REM  SKIP OVER SPACES
51590   PLACE% = PLACE% - 1
51595   IF PLACE% = 1 THEN GOTO 51610
51600   IF MID$(ENTRY$,PLACE%,1) < > " " THEN GOTO 51590: REM  IS IT A SPACE?
51605   PLACE% = PLACE% + 1       : REM  POSITION OVER FIRST LETTER
51610   GOSUB 52000               : REM  DISPLAY THE CURSOR
51615   RETURN
51620   REM
51625   REM  ***************
51630   REM  ERASE TO END OF LINE
51635   REM
51640   IF PLACE% = 1 THEN ENTRY$ = "": GOTO 51650: REM  ERASE WHOLE LINE
51645   ENTRY$ = LEFT$ (ENTRY$,PLACE% - 1)
51650   GOSUB 52130               : REM  PRINT THE FIELD
51655   GOSUB 52000               : REM  DISPLAY THE CURSOR
51660   RETURN
51665   REM
51670   REM  ***************
51675   REM
51680   REM  SKIP TO END OF LINE
51685   REM
51690   GOSUB 52070               : REM  MOVE THE CURSOR
51695   PLACE% = LEN (ENTRY$) + 1
51700   IF PLACE% > MAXSIZE% THEN PLACE% = MAXSIZE%: REM  DO NOT GO PAST END
51705   GOSUB 52000               : REM  SHOW THE CURSOR
51710   RETURN
51715   REM
51720   REM  ***************
51725   REM
52000   REM  PRINT CHARACTER IN INVERSE
52005   REM  THIS GIVES THE ILLUSION OF CURSOR MOVEMENT
52010   REM
52012   VTAB ROW%                    : REM  POSITION CURSOR
52015   POKE 36, (COL% + PLACE% - 1) : REM  HTAB
52020   INVERSE                   : REM  REVERSE VIDEO
52025   XX$ = MID$ (ENTRY$,PLACE%,1): REM  MOVE FOR THE NEXT IF
```

```
52030   IF XX$ = "" THEN XX$ = " ": REM  IF NULL MAKE IT A SPACE
52035   PRINT XX$;                  : REM  PRINT THE INVERSE
52040   NORMAL                      : REM  RESTORE TO NORMAL VIDEO
52045   POKE 36, (COL% + PLACE% - 1) : REM  REPOSITION THE CURSOR -  HTAB
52050   RETURN
52055   REM
52060   REM  ***************
52065   REM
52070   REM  POSITION AND DISPLAY NORMAL
52075   REM
52077   VTAB ROW% : REM  POSITION CURSOR
52080   POKE 36, (COL% + PLACE% - 1) : REM  HTAB
52085   XX$ = MID$ (ENTRY$,PLACE%,1) : REM  PRINT ONE LETTER
52090   IF XX$ = "" THEN  XX$ = FILL$ : REM  IF NULL THEN MAKE IT A SPACE
52095   PRINT XX$;
52100   REM
52105   POKE 36, (COL% + PLACE% - 1) : REM  REPOSITION THE CURSOR
52110   RETURN
52115   REM
52120   REM  ***************
52125   REM
52130   REM  DISPLAY TEXT$
52135   REM  FILL$ IS THE FILL CHARACTER
52140   REM  TXTSIZE% IS THE LENGTH OF ENTRY$
52145   REM  MAXSIZE% IS THE MAXIMUM ALLOWED LENGTH
52150   REM
52155   REM
52160   TXTSIZE% = LEN (ENTRY$)    : REM  HOW LONG IS THE CURRENT FIELD?
52165   MAXSIZE% = LEN (MASK$)     : REM  WHAT IS MAX LENGTH ALLOWED?
52170   REM
52175   REM  IS ENTRY$ TOO LONG?
52180   REM
52185   IF TXTSIZE% > MAXSIZE% THEN
          ENTRY$ = LEFT$ (ENTRY$,MAXSIZE%):TXTSIZE% = MAXSIZE%
52190   REM
52195   REM  POSITION THE CURSOR
52200   REM
52205   VTAB ROW%                  : REM  ROW POSITION
52210   POKE 36, COL%              : REM  COLUMN NUMBER - HTAB
52215   REM
52220   REM  PRINT THE TEXT
```

```
52225   REM
52230   PRINT ENTRY$;              : REM  NO LINE FEED
52235   REM
52240   REM  PRINT THE FILL CHARACTER
52245   REM
52250   IF TXTSIZE% = MAXSIZE% THEN RETURN : REM  NO FILL$ TO PRINT
52255   FOR XX = TXTSIZE% TO MAXSIZE% - 1
52260   PRINT FILL$;
52265   NEXT XX
52270   RETURN                     : REM  ALL DONE
52275   REM
52280   REM  ***************
52285   REM
```

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for the

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Alan Porter is a California-based microcomputer consultant.
Martin Rezmer has, for the last five years, been a computer store owner and consultant.

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